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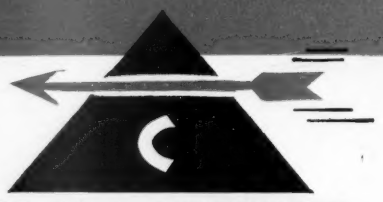

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WIRE & WIRE PRODUCTS

A monthly publication devoted to the production of Wire & Wire Products in all metals from the bar to the finished wire product.

Vol. 6 August 1931 No. 8

Official Publication of The Wire Association

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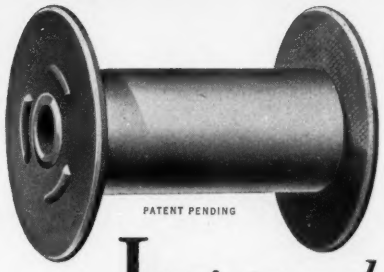

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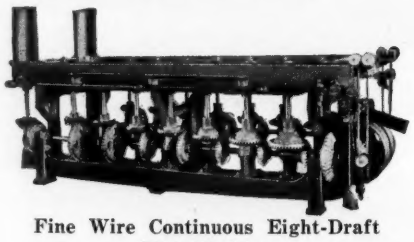

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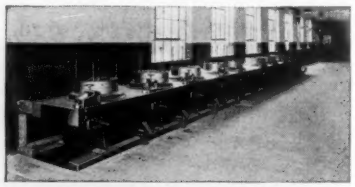

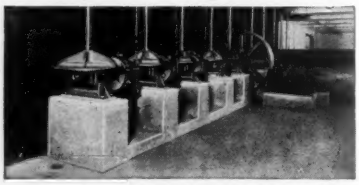

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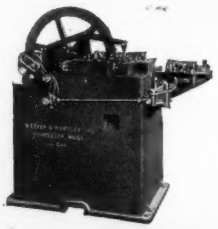

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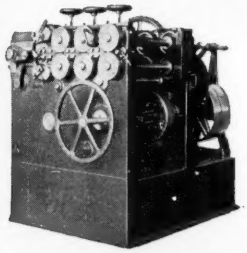

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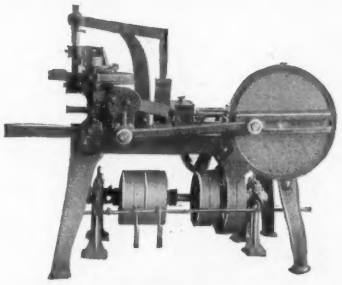

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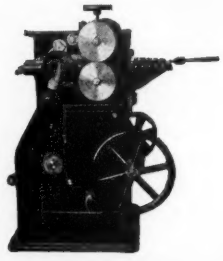

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WIRE
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A Monthly Publication Devoted to the Production of Wire and Wire Products in all Metals from the Bar to the Finished Wire Product.

Vol. 6 AUGUST, 1931 No. 8

Modern Rod Baking

By R. S. Coulter
Combustion Engineer

A paper presented at the annual meeting of the Wire Association describing an improved method of rod baking through the use of a forced ventilation and recirculation air system. ▲▲▲▲▲▲▲▲

COMPETITION for business in America is an insidious thing; someone is continually improving an operation which leads to greater production, lower costs and better quality which gives the user of the improvement an advantage over his contemporaries. In order to successfully cope with it, among other things, a manufacturer must ever strive towards greater production and lower cost consistent with quality standards and the ever increasing number of specifications for similar products. This to keep customers satisfied and to aid in arriving at a reasonable margin of profit.

Not so many years ago a wire manufacturer had no difficulty in keeping all the required grades on a single leaf of his note book. Not so now; a good sized note book is rather the vogue.

Because of these and other factors the operation of rod baking has come in for its share of appraisal and scrutiny and as might be expected the old methods with their single gait equipment shall inevitably find themselves hopelessly inadequate to meet the competition.

Requirements of Rod Baking Ovens

WHAT should we require of modern Rod Baking Ovens? In the opinion of the writer the following points should be stressed: (a) A better quality of product, i.e., rods should have uniform treatment in the oven; as to temperature; as to time of treatment; as to atmospheric conditions in the oven. All of which have more or less bearing on die cost per ton of drawn wire. (b) Tonnage flexibility. Because of the vast array of specifications it is frequently desirable to operate a line at higher or lower temperature without adversely affecting the capacity of the line, or because of peculiar local conditions variable capacity may be required, all of which must be accomplished without sacrificing quality of product. (c) Lower operating costs, i.e., lower fuel cost per ton of rods, lower labor costs, and lower maintenance costs. (d) Smaller floor space requirements.

A review of existing and proposed equipment seemingly points to the Forced Ventilation and Recirculation Air System of Rod Baking as fulfilling the requirements given above.

Description of System

A brief description of the System at this point is in order: The oven line construction is of the panel type, dimensions being in accordance with size of coils, method of transportation through the oven, and tonnage required. The frame work consists of light structural shapes, the partitions are sheet metal casings stuffed with insulation approximately 2″ thick and the roof and outside walls are also metal encased insulation but twice as thick, namely, 4″. This method of construction insures comparatively low first cost and has the important advantage of minimum heat loss due to radiation. No costly excavation for firing chambers underneath oven lines is necessary.

With the aid of a suitable heat exchanger or recuperator, which may be located adjoining to or on top of oven line and fired with that fuel which is most economical, and which may be either oil, gas, pulverized fuel or waste heat from adjoining processes; air under pressure of several inches of water from a fan is caused to pass through the heat exchanger where it is preheated and from which it is directed through a heat insulated duct transversely across the roofs. This duct is necessarily located near the discharge end of the oven lines. Individual connections from this duct to each oven line is provided, the connections or leads, rectangular of cross section, dropping vertically along the partition walls to the floor from whence the air is directed along the bottom of and parallel to the oven floor for the entire length of the oven. (This duct length is arbitrary.) The air is released from this floor duct through a suitable aperture which may be a long narrow slot extending the length of the duct, or it may be released through a series of orifices the sizes of which are carefully determined for correct distribution and volume flow.

At the charging end of the ovens and through the roof are individual dampered oven openings connecting to another transverse insulated air duct running across the roofs. This duct leads back to the inlet of the fan serving the heat exchanger mentioned above, thus completing the circuit for air travel.

In addition to the two ducts already mentioned a third non-insulated duct is installed across the roof and connected individually to the ovens through dampered openings. This duct leads to a fan or a stack the purpose of which is to collect a certain percentage of the air which has performed its work in the individual ovens and bleed it to the atmosphere. This is necessary to reduce the degree of moisture saturation in the recirculation system. The deficiency of air is made up by taking in the required volume through a damper at the inlet of the circulating fan.

The correct location of the bleeder outlets from ovens is a matter of opinion. The writer's personal preference being to locate these openings at a point or points furthest away from the point of inlet or release of preheated air within the oven in order that the preheated air may perform maximum service.

A diagrammatic layout of the system is shown in Fig. 1. Discussing this system by analysis of some of its component parts and referring to Fig. 1, we find the heat exchanger or recuperator marked "A", which is connected to a brick lined combustion chamber "B". Fuel is burned in the combustion chamber, the hot products of combustion passing through or around the elements of the recuperator transferring a portion of its sensible heat to the

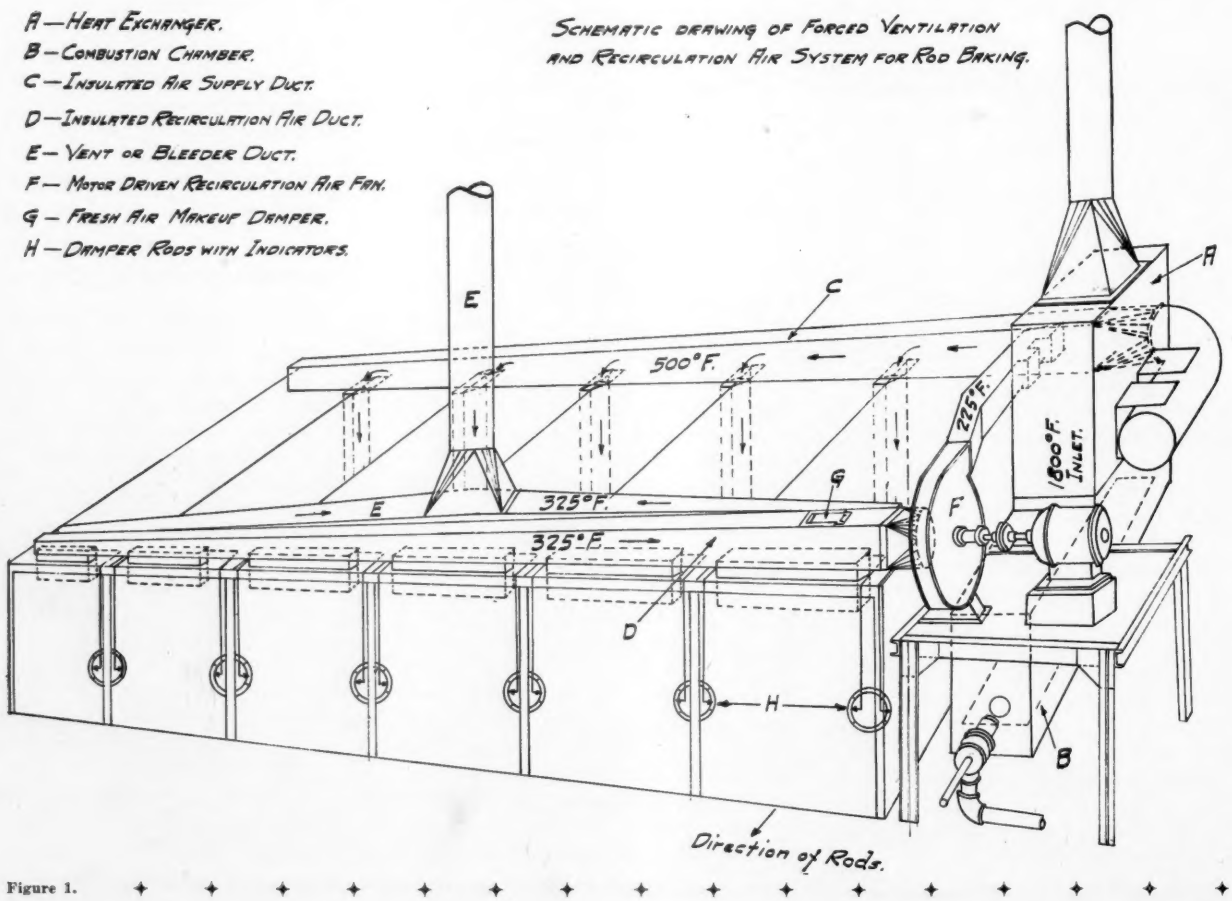

Figure 1.

air which in turn is forced to each individual oven where the useful work is performed. Temperature of the hot products of combustion entering the recuperator is not more than 1800° F. which is considered the safe working temperature of the metallic heat resisting elements. Automatic devices are usually provided to safeguard the equipment against abuse and overheating. Flue gas outlet temperatures will probably average 800° F.

Fuel Costs

THE fuel used for firing the recuperator combustion chambers may be any fuel which is economically suitable for the local conditions and which lends itself to easy control and a minimum of attendance. Estimated fuel costs per net ton of baked rods with this system is shown in the following tabulation:

Fuel Used	Cost of Fuel in Furnace per unit*	Estimated Fuel Cost per Net Ton of Rods Baked.
Heavy Fuel Oil	$ .03 per gallon	11.6 cents
Natural Gas	$ .40 per 1000 cu. ft.	22.8 cents
Pulverized Coal	$5.00 per net ton	10.6 cents
Coke Oven Gas	$ .15 per 1000 cu. ft.	17.1 cents
City Gas	$ .60 per 1000 cu. ft.	68.0 cents
Waste Heat	No cost value	3.0 cents**

* For unit fuel prices other than shown use direct ratio to determine estimated Fuel Cost per net ton of rods baked.

**Cost of operating induced draft fan to pull waste gases from adjoining heating processes to reclaim waste heat.

Local conditions, of course, govern the selection of fuel for this purpose. Where there are pot annealing furnaces in close proximity to the bakers, which furnaces work with some degree of regularity and have considerable tonnage, the waste flue gases could be put to profitable use in preheating the air in the heat exchanger using purchased fuel only to make up waste heat deficiency if and when it occurs. In this case the cost of heat for rod baking would be very low indeed.

These fuel cost figures just given in the tabulation are based on the use of trucks or buggies to transport the rod coils through the ovens. With the use of a monorail and hook system of transportation the fuel cost would be somewhat less depending on the difference in weight between the two systems. The monorail system would probably reduce by 7 to 10% the fuel cost figures given in the tabulation.

Heat Balance of System

A HEAT balance of the system is of interest and is given forthwith:

Heat Input (Fuel)	100%
Heat Output	
Flue gas loss in Heat Exchanger	50%
Net heat to charge from preheated air	27%
Heat lost due to venting air	14%
Radiation, unaccounted for	9%
	100%
Overall thermal efficiency	27%

Preheated air leaving the recuperator may be 450° to 650° F., this air under pressure and passing at high velocity through the insulated duct enters the individual ovens at very little loss in temperature, where it performs its work of dehydration and probable dehydrogenation. Temperature of recirculated air leaving the ovens is around 300° F. and represents probably 70% of the total air entering the oven. The remaining 30% is bled to the atmosphere as explained before, the makeup fresh air which is at atmospheric temperature is admitted at the inlet of fan which dilution brings the final temperature of recirculated air to about 225° F. at the completion of the cycle.

An idea of the size of fan used for recirculation purposes may be had from the fact that approximately 6500 to 7000 lbs. of preheated air is used per hour per oven line to produce from 1.3 to 1.5 tons of product. On a basis of 225° F. inlet air temperature the volume handled by the fan would be about 1900 cfm. per oven line producing the above tonnage. When it is desirable or necessary to have more than six oven lines to take care of cleaning house production then additional preheater and fan units with their unit ducts are advisable. This provides an extremely flexible tonnage arrangement with comparatively small auxiliary units and freedom from complete shutdowns due to mechanical troubles. Heat exchangers or air heaters sufficiently large would probably cost $1000.00 to $1200.00 per oven line.

The ovens proper are operated at a slight positive pressure and with correct distribution of heated air within the oven insures constant and uniform baking temperatures which is highly desirable. The preheated air performing its principal work of dehydration of the lime coating on rods passes out of the oven in two streams at temperatures of about 300° to 350° F.; 70% returns to the recirculation system and 30% is bled to reduce the moisture concentration. This quantity of bled air may be varied by manually or automatically controlled individual oven dampers. The bleeder duct is connected to a stack or induced draft fan of small power requirements, which carries the moisture laden air out of the building.

With individual dampers controlling air outlet and bleeder air from each oven, balanced oven conditions over a wide variety of operating requirements can readily be maintained. At times it may be desirable to operate one or more oven lines at higher or lower temperatures than normal. This is easily accomplished with this flexible arrangement.

Advantages of Method Described

WHERE new ovens are contemplated serious consideration should be given this method of rod baking because of the many advantages offered, such as, (a) Low first cost aproximately $3000.00 per oven line completely erected and ready for operation. Comparing this cost with the cost of the old style brick ovens individually fired there is much to be saved; (b) Centralized heating equipment which provides a means to lower labor costs and better control of heat; (c) Increased tonnage capacity per oven line, it being conservatively possible to produce in excess of 1.5 net tons of baked rods per oven line per hour; (d) Lower maintenance costs are possible through elimination of the individual firing chambers; (e) Lower fuel costs with more uniformly baked rods. The old style conventional individually fired ovens with their up and down fires do not lend themselves particularly to even oven temperatures and their thermal efficiencies do not compare.

Conversion of Existing Ovens

EXISTING ovens of the old type can usually be converted to this type of heating, the necessity for converting being to obtain, (a) Greater capacity with existing equipment; (b) Lower cost; (c) More uniformly baked rods. The cost of conversion may reasonably be set at $1500.00 per oven line.

Control Methods

ORDINARILY dampers controlling flow of preheated air supply, and quantity of vented air are manually operated by means of rods extending down within easy reach of the operator. With the aid of suitably designed indicating scales and thermometers the operation is easily controlled with a minimum of lag or inertia which is so common with the old style ovens.

Full automatic control of the system is applicable and desirable but not absolutely necessary to obtain good results and high capacity. For example thermal control elements may be placed in the recirculation connection which in turn causes the opening or closing of dampers in the preheated air supply ducts. Similarly the volume of vented air may be automatically governed by the use of humidity control elements placed in the individual bleeder connections and actuating a damper arrangement. This feature would tend to increase the overall thermal efficiency by limiting and varying the quantity of relatively high temperature vented air depending on the varying amount of moisture concentration. Fuel supply to the heat exchanger can be automatically controlled from the temperature of preheated air.

When entrance and exit doors are opened electric contact actuated by opening of doors, closes the damper in the air supply duct preventing the waste of preheated air.

Heat Exchanger Design

THE type and design of the heat exchanger, which after all is the heart of the entire system, will merit special comment. Needless to say perhaps the heater should be of a type that is absolutely free from leakage between air and flue gases inasmuch as it is necessary to have the air under positive pressure and usually the flue gas passages are under a slight negative pressure. Any leakage of air not only means a loss of baking heat and hence lower thermal efficiency but is positively detrimental to the heating elements should there be incompletely burned gases. The heating elements, particularly those first coming in contact with the hot gases from the combustion chamber, should be made of heat resisting steel capable of withstanding 1800° F. continuously without undue deterioration and joints of fabricated elements, if there be such, should be in such location that there is no danger of burning off at the welds to cause leakage. There should be a minimum of draft resistance in the flue gas passages so that it shall not be necessary to use an induced draft fan, which fan would complicate the system and mean another moving part. If possible the air travel through the heater should be counter flow to the flue gases to insure rapid heat transfer between gases and air. A temperature controlled device should be furnished which shall prevent the hot products of combustion entering the heater at temperatures exceeding the safe working temperature of the metal used in the heater, which temperature let us say shall be 1800° F. This device need not be elaborate, a simple damper opening arrangement to the combustion chamber, which admits excess air to the hot gases diluting them and hence lowering the temperature, would suffice. Also, it is desirable to install a fuel cut off valve acting independantly of all other control which shuts off the fuel automatically if the electric current driving the recirculation fan should fail. This is necessary to save the heater from overheating and possible damage should the fuel continue to burn with no air circulation to carry away the heat. In this case the automatic damper described above could hardly be expected to take care of this emergency.

The sheet metal casings covering the insulation in partitions and side walls, the inside distributor ducts, and duct connections should be of copper bearing or other rust resisting metal for obvious reasons. The insulation used should be suitable for working temperatures of the ducts and ovens, that is, it should not deteriorate and cause undue shrinkage at working temperatures.

Advantages of Forced Ventilation and Recirculation Air System

SUMMING up and tabulating the advantages and items of interest of the Forced Ventilation and Recirculation Air System for Rod Baking we have:

1. Lower Installation Cost, and Low Conversion Cost, $3000.00 and $1500.00 per oven line respectively.
2. Greater tonnage capacity, 1-½ or more tons per oven line per hour.
3. Low Fuel Costs per ton baked rods; using fuel oil at 3 cents per gallon the cost is less than 12 cents per ton.
4. Comparatively high thermal efficiency, 27%.
5. More uniformly treated rods, leading to lower die costs and better quality product.
6. Centralized heating equipment, which lends itself to easier control and lower labor costs.

With the revamping or enlarging of cleaning departments one will do well to appraise his bakers and make such improvements or betterments as will be justified depending on local necessity. The foregoing paragraphs indicate one very good way of modernizing this important piece of equipment.

✦ ✦ ✦

For other papers presented at the Wire Association meeting — See Wire and Wire Products for September and October.

Wire Mill Management

By E. G. Brown

Assistant Factory Manager U. S. Rubber Co., Bristol, R. I.

The importance of proper control of plant investment and goods inventory outlined in a paper prepared for the Wire Association. ▼▼▼▼▼▼

YOUR secretary was prompted to request this paper because of an interview had with me by a representative of the New York Times recently. This interview appeared under the title of "Excess Machinery Costly to Industry."

The interview was intended to emphasize how important the control of plant investment and goods inventory had been during 1930 and how vital such control will continue to be during the present business period.

In selecting the subject for this paper it was decided to refer to the continuing importance of an inventory control and more especially to bring out "that during this year industry is confronted with a sensible readjustment of selling prices to proper manufacturing costs, all of this to be based on a better knowledge of costs than now prevails in the wire industry."

THE importance of both of these subjects has been stressed of late in frequent newspaper and magazine articles pointing out the serious effects of unreasonable inventories during a period of continuously falling commodity price levels, and of the frequent tendency during such a period to offer merchandise generally at less-than-cost levels. As a matter of fact the recent extemporaneous talk by Mr. Farrell, of the U. S. Steel Corporation before the American Iron and Steel Institute was almost en-

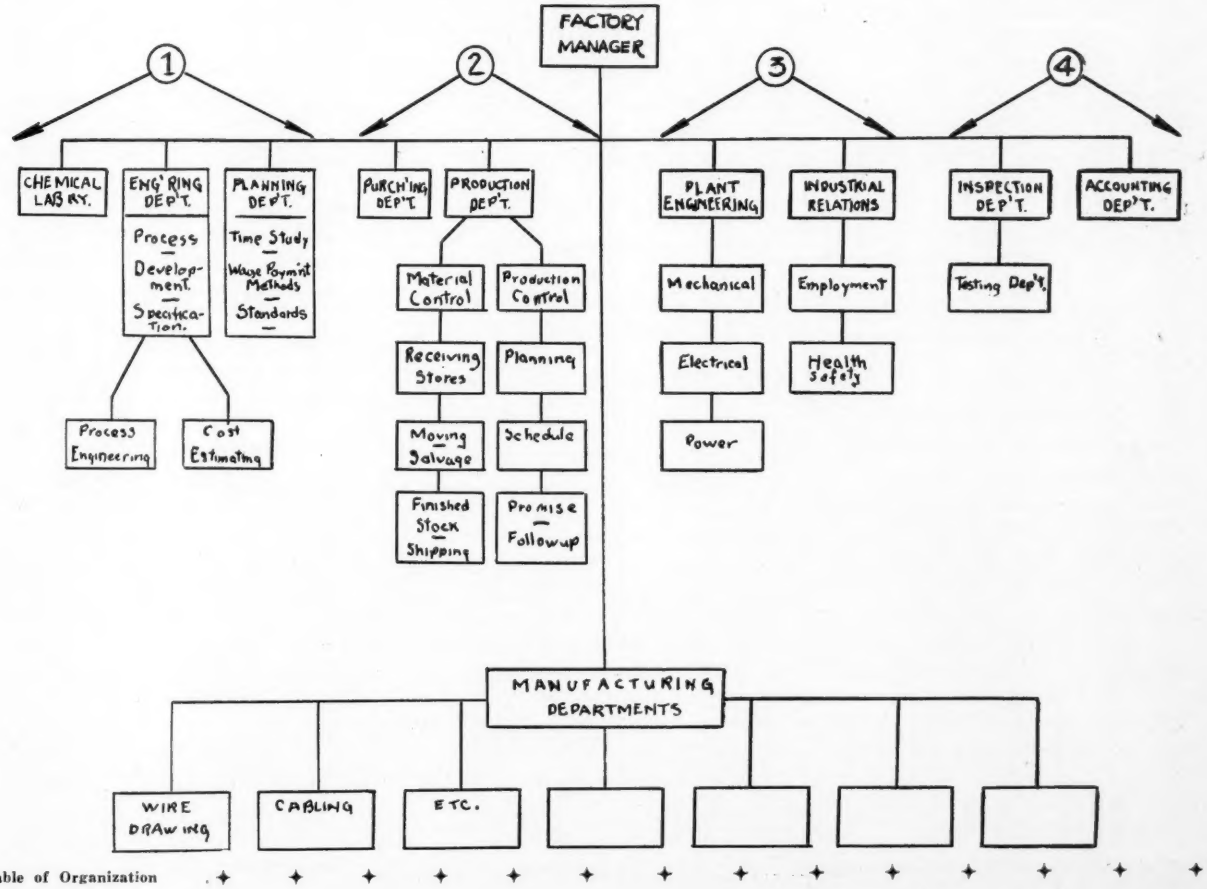

Table of Organization

tirely along these lines. You will recall that this talk attracted a great deal of attention on account of its sponsorship by such important interests.

Now, the wire industry is in ltself, a very large business! It is quite possible for one unit or company in this industry to manage its own affairs so as to keep the factor of inventory values under adequate control, but the most valuable contribution, that any individual company can make to the larger problem of industrial cost practice and understanding is to advocate methods that are sound and proper enough to cause their acceptance to be considered by the industry generally when the facts are brought out. It is not intimated that such an accomplishment would necessarily have the desired result of bringing selling prices into a decent relationship to selling costs, but at least it does have the effect of substituting some facts in place of opinion and prejudice, and this is a process out of which better result must come eventually In such a development an association group like the Wire Association can take a leading and helpful part.

✦ ✦ ✦

Without going too far into the necessary details, it is my purpose here to show how the United States Rubber Company, Wire Division, has attempted to meet the two problems of investment control and development of manufacturing cost practice, and to indicate the accomplishment that is possible when studious effort is directed along these lines.

It is not the intention to suggest that the steps taken are necessary to other companies, but it is hoped that the objects sought may prove to be of general interest.

Manufacturing Organization

FIRST of all, let us describe our manufacturing organization arrangement. (This is shown in the accompanying chart):

1. The Laboratory and Engineering Departments completely define and prescribe the manufacturing processes and their costs on a standard basis.
2. The Planning Department devises the wage payment methods and their rates.
3. The Production Department determines material requirements, provides materials through requisition upon the Purchasing Department, determines running schedules and performs all follow-ups.
4. The Various Manufacturing Departments operate according to these plans.
5. Plant Engineering and Industrial Relations Departments mantain standard equipment and working conditions.
6. Inspection and Accounting Departments determine the results of operations in terms of quality and cost.

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BY this arrangement Group 1, (Laboratory, Engineering & Planning Departments) is responsible for the establishment of operating standards, Group 2 (Production and Manufacturing Departments) for the control of operations in accordance with these standards, Group 2 (Plant Engineering and Industrial Relations Departments) for the maintenance of plant standards, and Group 4 (Inspection and Accounting Departments) for the inspection and interpretation of the results of operations.

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Let us consider Group 2, which is principally concerned in the handling and control of materials. You will observe that the Production Department is in entire charge of the determination of the amount of materials required by orders, (according to standards, furnished by the Engineering Department) i. e., the requisition, receipt, storage, moving, shipping and salvage. Within this one function is located the entire responsibility for the handling of production materials from the time that the requirement is developed by the receipt of a customer's order to the time of disposition as furnished goods, shipment or salvage material.

In the operation of this function it is the practice to take the incoming orders, break them down immediately into the raw material requirements and to post these requirements against the various items in the Material Control File, which is kept in a Kardex Visible Cabinet. Requirements on important items, such as copper are placed with the Purchasing Department daily; on other items the requirements are accumulated until they represent a purchasable quantity; in still other cases requisitions are placed on a "minimum quantity in stores," or "quantity to be ordered" basis.

Selection of the method is, naturally, determined by the nature of the item. Specification as to delivery is adjusted in all cases so as to have the time of receipt of the incoming raw materials agree as closely as possible with the necessities of the production schedule.

This method has had the effect of releasing a large amount of space previously used for storage, and has further made certain that all of the proper materials for special orders are actually at hand when required, instead of plenty of a slightly different but unsuitable kind.

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The production follow-up system is similarly organized, using a visible card cabinet, and the same requirement for expeditious movement is imposed.

It was found that the elimination of "out of Stores" and "In-Process" Materials particularly of obsolete and slow-moving items and the insistence upon a rapid conversion had the effect of reducing the production problem to far more understandable proportions.

Results of System

THESE revisions in the operating plan were inaugurated at the beginning of 1930. Allowing for the time of their installation and adoption they were, therefore, not effective over the entire year. Nevertheless, during that period while activity was maintained at 95% of the previous year's activity, "Raw Materials," account was reduced 65.5% "Goods-in-Process," account 78%, and "Finished

Goods Accounts," 40%.

The turnover of Raw Materials increased from 16.9% to 29.6%, annual basis, and of Productive Inventory (Raw Materials and Goods-in-Process) from 7.4% to 15.4%. Considering the relatively large significance that material cost value has in the insulated wire business you will readily appreciate that the values released by this performance were very significant and without waiting for the additional advantages that can certainly be expected when business improves it is fair to say already, that our organization of a definite material control function has entirely justified itself by its performance.

Also, during this period, a three-shift 24 hour working day was organized with corresponding increases in the productivity per equipment unit. It was possible to abandon and remove more than a quarter of a million dollars worth of antiquated machinery. The fact that the volume of production was maintained demonstrates that the ability of the plant to produce was not in any way impaired.

More Detailed Product Specifications Found Necessary

AS a part of the process of getting these procedures established it was necessary to create more satisfactory detailed product specifications. In our organization plan, this is immediately the function of Group 1, concerning the Laboratory, Engineering and Planning Departments. At present the standard, in design, construction, and unit operation time allowances, etc., is prepared for every article, whether stock or special, in advance of the entry of the article with the Production Department for manufacturing.

These standards take the form of purchasing specifications according to which incoming raw materials are checked by the Laboratory; operating specifications according to which the product will be manufactured; and detail standard estimates which display all of the factors of manufacturing cost per unit, i. e., material, labor, burden, scrap, etc.

Standards Cost System

THE establishment of these standards laid the foundation for a change to a standards cost system. With this revised system we are now equipped to measure the variation in material costs from standard, not only in the particular of variation in purchase price but also in usage on important materials such as copper and rubber, likewise the variations in labor and burden by operations and also by departments, and the experience with scrap cost as compared to the expected standard scrap cost. This procedure is neither laborious nor expensive since liberal use is made of electric tabulating equipment.

The same equipment is also used to maintain the Finished Goods record, not only for the plant stock but for all our various branch stocks as well.

Time does not allow of the disclosure of the extent to which the adoption of these plans has affected our performance in respect to cost. Besides we do not yet consider that the work is finished. But I can assure you that all the elements of cost in our operation have been tremendously and favorably influenced by the substantial changes that I have just outlined. We have no inclination now to operate in any way except that of having a plan prepared in advance and keeping progress constantly checked on the basis of the plan.

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I REALIZE that in all these adaptations consideration has to be given to the variable factors of plant size, range of goods made, local conditions, etc., and it is certain that any application that would be attempted without reasonable recognition of these conditions would contain a considerable prospect of failure. Similarly, a fixed plan that would not contemplate a continuous development and refinement in accordance with experience would be most unsatisfactory.

It would seem, however, that within a single industry greater leveling efforts in manufacturing and cost practices are possible than those which have so far been exerted in this industry. The National Electrical Manufacturer's Association refers to this indifference in a recent bulletin. Quoting its Director: "I have been impressed by certain conditions which I think worthy of bringing to your notice. The first impression is that by the use of existing accounting methods cost figures are not on a comparable basis. These figures do not reveal the true economic differences in costs between competing companies. Under these conditions it is obvious that price competition is influenced and affected by unsound and unsatisfactory methods of cost accounting".

That is the circumstance that I have already referred to in the beginning as requiring "a **sensible** readjustment of selling prices to **proper** manufacturing (and distribution) costs". "Proper" is used in the sense of excluding all except perfected manufacturing and managerial methods, and "sensible" in the sense of adequately interpreting the results of the employment of those methods.

At this point it would be logical to point out that such a uniformity in cost and accounting procedure will not be fully realizable until greater uniformity in product specification is accomplished. But it is not likely that the development of procedures for bringing out the facts of cost will add desirable emphasis to the necessity of agreement upon product specification?

In this sketchy effort I have attempted only to indicate in a general way what the Wire Division of the United States Rubber Company has done to prepare itself for the acceptance of an improved procedure along these lines when such a procedure is ultimately proposed.

The past two years have definitely proven that there is no room for complacency even in the wire business. If complacency does not set in there is ample room for continuous improvement in the essential particulars mentioned.

Wire Galvanizing Processes

Geoffrey K. Rylands, of

Rylands Bros. Ltd., Warrington, Lancashire, England

The second paper of a discussion on

HOT GALVANIZING VS. ELECTRO GALVANIZING

between Mr. L. D. Whitehead of Whitehead, Hill & Co., Ltd., and Mr. G. K. Rylands of Rylands Brothers, Ltd.

Mr. Rylands takes issue with Mr. L. D. Whitehead of Whitehead, Hill & Co., and presents his ideas on the hot galvanizing process and criticises the electro-galvanizing process.

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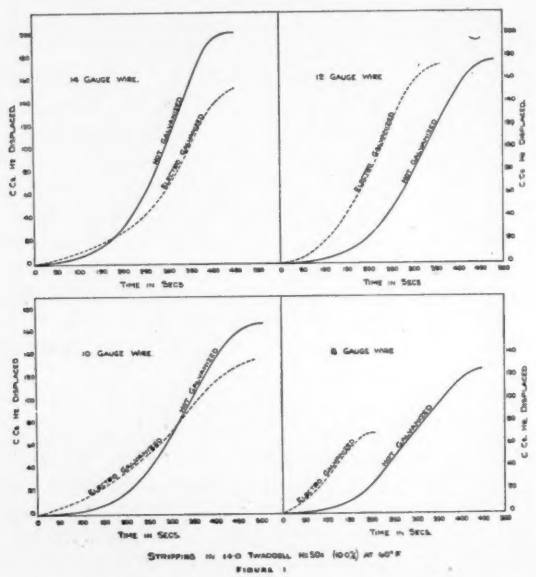
At the conclusion of this series of articles Mr. W. H. Spowers, Jr., well-known consultant on galvanizing, will review the controversy.

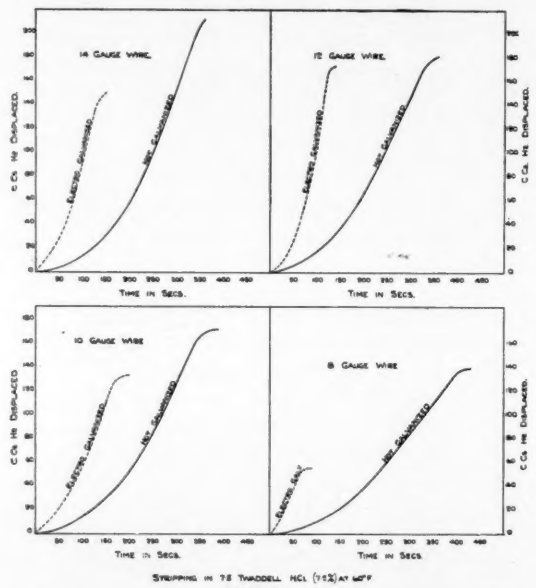
MY attention was attracted by an article which appeared recently, entitled, "A Pure Zinc Galvanising Process," which title alone is sufficient to command the attention of anyone who is concerned with the production of galvanized wire. The very improbability of such a thing was sufficient to give one a thrill of anticipation, but I am free to admit that the article disappointed me. The matter is of serious import to the galvanised wire trade, and, in my opinion, the article is not free from the criticism that it is an unfair attack upon hot galvanising, a process in which I am personally interested. In this age of advertisement and slogan it is not unreasonable to blow one's own trumpet; we must let the world know our virtues; it will find out our vices soon enough, but no one is entitled to belittle a competitor's products, and, if your contributor had confined himself to describing a particular process of electro-galvanising and praising its merits, I for one should have remained silent. Unfortunately, I feel that the article contains inaccurate criticisms of the hot-galvanising process, which call for an answer, and what follows gives the result of a series of comparative tests and examinations of samples in different gauges produced by both processes, and, where necessary, set forth in parallel columns. It will be noticed that the particulars give details of those tests specifically referred to in the article which you have already printed.

WITH this object in view, I obtained, in the ordinary way of trade from a reputable merchant, four full coils of electro-galvanised wire in gauges 8, 10, 12, and 14 I. S. W. G. These were delivered bearing the manufacturer's label intact. Their condition on delivery was good, and they showed the typical surface deposit of zinc oxide characteristic of electro-galvanised wire. Their appearance was, therefore, dull and unpleasing. I deemed that they had been galvanised about a week or ten days before delivery, and I



STRIPPING IN 10-0 TWADDELL H_2SO_4 (100%) AT 60°F

FIGURE 1



STRIPPING IN 7.8 TWADDELL HCl (7.8%) AT 60°F

FIGURE 2.

therefore obtained from our warehouse four coils of hot-galvanised wire in the same gauges, galvanised about ten days previously.

It should be noted that I did not order the electro-galvanised wire to any specification, and it may be assumed, therefore, that it was ordinary commercial quality. Similar wire was, therefore, taken from the common stock in our warehouse.

CHEMICAL analyses and physical tests were made on both sets of samples. These indicated that the material in each case was a low-carbon mild steel having a carbon content of about 0.07 per cent, with a tensile strength as finished of about 30 tons per sq. in. The hot-galvanised wire was drawn from British steel, made by the Partington Steel & Iron Co., but we have no information regarding the origin of our competitor's steel.

Preece Test

FOR this test a neutral solution of copper sulphate, having a specific gravity of 1,170, and maintained at a temperature of 60° F., was used. Three samples in each gauge were tested and stood one-minute dips as follows:—

	Hot-galvanised			
Gauge:	8	10	12	14
	5½	3	3	3
	5½	5	3	3
	5½	5	4	3
	Electro-galvanised			
Gauge:	8	10	12	14
	3	5	4½	4
	3½	5	5	4
	3½	4½	6	4½

IT will be observed that the results from the electro-galvanis- wire in 8 gauge are poor, but in the finer gauges the tests are very satisfactory. In the case of the hot-galvanised wire, the tests in 12 and 14 gauge are distinctly inferior to the results from electro-galvanised wire. I regard these tests as below standard, but, as stated above, the wire was taken from our warehouse without selection in precisely the same way, no doubt, as our competitor's wire. I stress this point so as to emphasise that no attempt has been made to select thoroughly perfect samples.

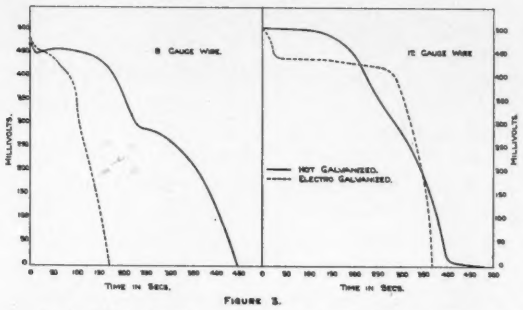


FIGURE 3.

Wrapping Test

IN this case all wires were wrapped round a mandrel equal to their own diameter. Flaking or peeling of the spelter coat constitutes failure, and a wire is deemed to have failed if, when rubbed as hard as possible between the finger and thumb, particles of spelter visible to the naked eye are detached. Both the hot-galvanised wire and the electro-galvanised wire stood this test satisfactorily.

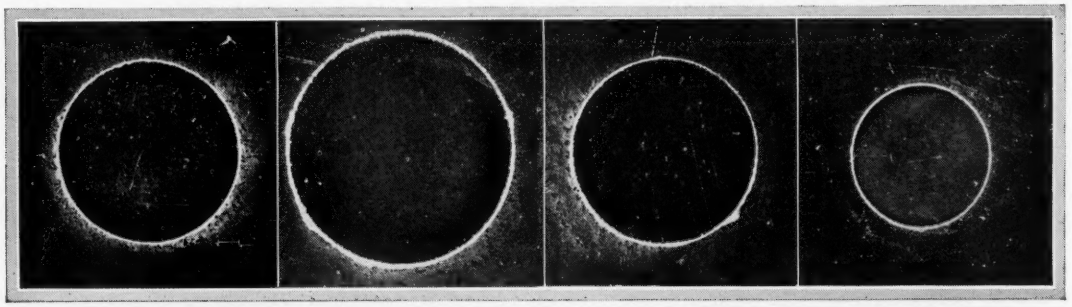

8 Gauge X 11. 10 Gauge X 17. 12 Gauge X 17. 14 Gauge X 17.

Figure 4—Cross Sections of Hot-Galvanized Wires.

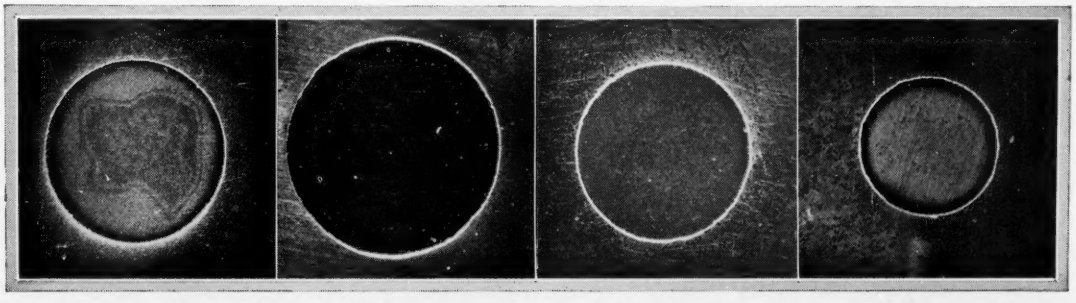

8 Gauge X 11. 10 Gauge X 17. 12 Gauge X 17. 14 Gauge X 17.

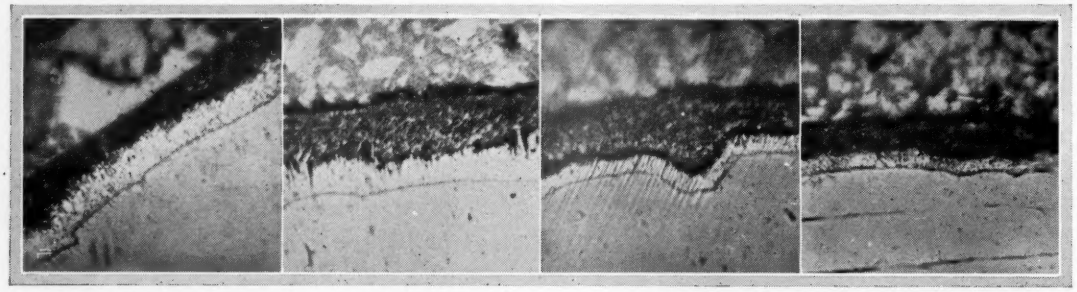
Figure 5—Cross Sections of Electro-Galvanized Wires.

Wrapping Test Followed By Preece Test

IN this test each sample of wire was wrapped eight times on its own diameter and unwrapped again, and then subjected to the Preece test, as described above. The number of dips which each sample stood is tabulated below:

	Hot-galvanised			
Gauge:	8	10	12	14
	5½	5	3½	3
	Electro-galvanised			
Gauge:	8	10	12	14
	1	1	1	1½

These results show that the electro-galvanised wire has suffered severely, and the dips have been reduced almost to vanishing point.



8 Gauge. 10 Gauge. 12 Gauge. 14 Gauge.

Figure 6—Hot-Galvanized Wires. Magnified 460 Diameters.

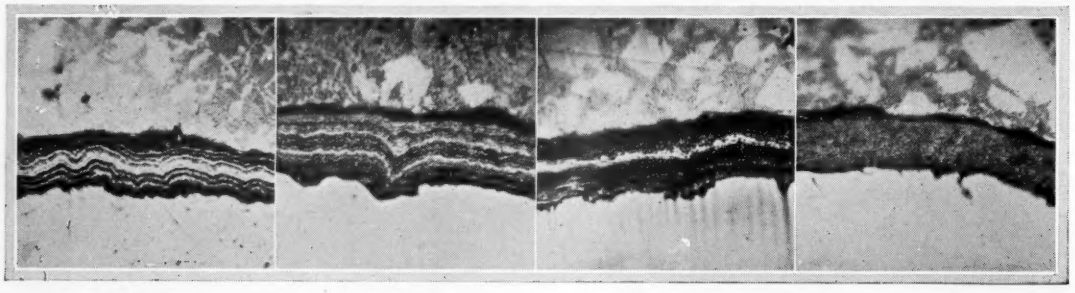
On the whole, these figures are well in favour of the hot-galvanised wire. In the 14-gauge wire only the time taken to strip is identical for both qualities.

For the test in hydrochloric acid a 7½ per cent solution maintained at a temperature of 60° F. was used, and the times taken to strip 10 grams of wire were as follows:—

Quality	**Hot-galvanised**
8 Gauge	450 seconds
10 Gauge	510 seconds
12 Gauge	480 seconds
14 Gauge	450 seconds
Quality	**Electro-galvanised**
8 Gauge	210 seconds
10 Gauge	490 seconds
12 Gauge	360 seconds
14 Gauge	450 seconds

end of the test, the last shell of zinc came away from the surface of the steel in flakes and fell to the bottom of the beaker and continued to dissolve there. The progress of the stripping test can be shown graphically by observing the number of cubic centimetres of hydrogen displaced at various time intervals and plotting the results. Comparative curves in both sulphuric acid and hydrochloric acid are shown in figs. 1 and 2. These results would seem to show that, so far as resistance to corrosion by acid is concerned, the hot-galvanised possesses substantial advantages over the electro-galvanised coat.

I would hesitate to disagree with such an eminent authority as Professor Burgess, of Wisconsin



8 Gauge. 10 Gauge. 12 Gauge. 14 Gauge.

Figure 7—Electro-Galvanized Wires. Magnified 460 Diameters.

Stripping Tests

THESE were carried out in both sulphuric acid and hydrochloric acid. In the case of the sulphuric acid a 10 per cent solution was used, maintained at a temperature of 60° F. Precisely 10 grams of wire was introduced into the solution, and the time taken to strip all the coat from the surface ascertained. The results obtained were as follows:—

8 Gauge	430 seconds
10 Gauge	390 seconds
12 Gauge	360 seconds
14 Gauge	360 seconds
Quality	**Electro-galvanised**
8 Gauge	90 seconds
10 Gauge	200 seconds
12 Gauge	140 seconds
14 Gauge	150 seconds

In both hydrochloric and sulphuric acid the action on the electro-galvanised samples was very violent, and, towards the very

University, U. S. A., but if he did really obtain the results quoted by your contributor in "A Pure Zinc Galvanising Process," he must have been examining a very different quality of electro-galvanised wire than that of the samples which we have been fortunate enough to obtain.

Percentage of Coat

THE amount of coat on each sample of wire has been deter-

mined by weighing a piece of wire as received, stripping the coat from it and re-weighing. Three determinations in each gauge were made, and the results obtained on both hot-galvanised wire and electro-galvanised wire were as follows:—

Hot-galvanised

% zinc on weight of coated wire				
Gauge:	8	10	12	14
	3.72	4.71	5.24	5.98
	3.54	4.68	5.26	6.02
	3.47	4.59	5.33	5.93

Electro-galvanised

% zinc on weight of coated wire				
Gauge:	8	10	12	14
	2.21	4.14	4.75	4.30
	1.88	4.12	5.00	4.33
	1.81	4.08	4.95	4.35

Electro-potential Tests

I ATTACH very little importance to the electrical potential test. The results obtained from it are apt to be most misleading, and will depend very largely on the type of electro-lyte, its concentration, and whether or not a depolariser is present, and, if so, in what quantities.

The reasons are fairly clear, and I need not go into them, but it is worth mentioning in passing that, even in making comparative tests between hot-galvanised wire and electro-galvanised wire, by altering the conditions of the test the apparent relative merits of the two qualities can be entirely altered. Your contributor of the article on the "Electro-Galvanising Process" will probably maintain that the only true conditions are those wherein the electro-galvanised wire is found to be superior. He may be right, but the matter has not been proved one way or the other, and a great deal more research is necessary into the method of application of this test before any opinion can be expressed as to whether it is of value or not. However, I show in fig. 3 the comparative time-potential curves obtained on the two sizes of wire, 8 gauge and 10 gauge. I have selected these two sizes since, of the electro-galvanised wires, the 10 gauge is reasonably good and the 8 gauge is about the worst, while there is nothing very much to choose between any of the hot-galvanised samples. In this test the electrolyte was a 5 per cent solution of sulphuric acid to which 2.8 per cent potassium dichromate had been added as a depolariser.

Micro-examination

THE miscroscope is a useful friend but a dangerous master. In order to use it effectively one has got to be acquainted with the technique of the etching and preparation of specimens, and also with that of micro-photography. We all know the appalling results which we obtained as schoolboys when we were presented with our first camera.

As an example, it is quite obvious that the photo-micrograph (fig. 2) in your article entitled "A Pure Zinc Galvanising Process" has been prepared by one with a poor knowledge of the technique of the art. The specimen has been badly over-etched, and, as a consequence, the whole structure of the coat is obliterated.

The microscope can usefully be employed to show the concentricity or otherwise of a galvanised coat. Low magnifications only are necessary, and in figs. 4 and 5 cross-sections of hot-galvanised and electro-galvanised samples in each gauge is shown. The 8-gauge samples are magnified to 11 diameters and the remainder to 17 diameters. The photographs demonstrate very clearly that, so far as concentricity of coat is concerned, the electro-galvanised wire possesses no advantages over hot-galvanised. Photo-micrographs (figs. 6 and 7) show the coat structures of the hot- and electro-galvanised wires in each gauge. The specimen in each case has been mounted in a soft alloy for polishing purposes. The alloy is seen on the upper side of each photograph, and the steel wire occupies the lower portion. The coat lies between the two. All these photographs are magnified to 460 diameters. In each of the

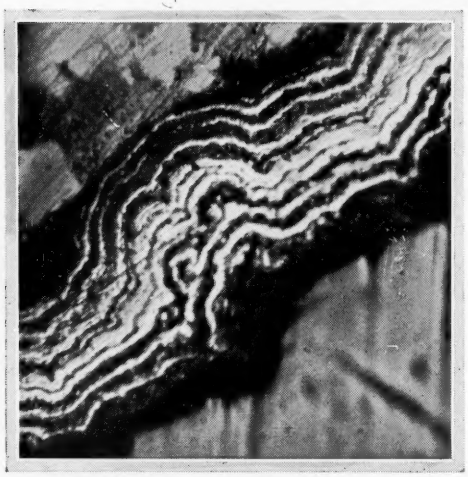


Figure 8—Electro-Galvanized Coat, Showing Distorted Laminae. X 1,200.

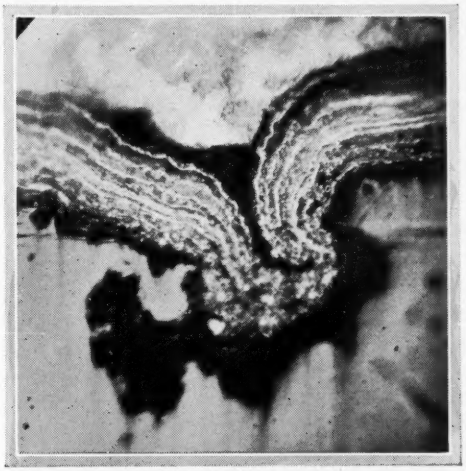


Figure 9—Electro-Galvanized Coat, Showing Effect of Surface Flaw in Wire. X 1000.

hot-galvanised wires it will be observed that there is a compact layer of zinc-iron alloy next to the wire, and, super-imposed on this, is the coat of substantially pure zinc. Its purity is demonstrated in the photo-micrographs, and is confirmed by the solution velocity tests described previously.

The photo-micrographs of the electro-galvanised sections show that the coats are most impure and of a non-crystalline laminated character. The laminations become less pronounced in the smaller sizes and are absent in the 14-gauge sample. Photo-micrograph (fig. 8) of the 8-gauge sample, magnified to 1,200 diameters, shows the distortion of laminæ, probably due to enfoliation of impurities in the electrolyte. This and the other photographs of the electro-galvanised samples shows inclusions of large quantities of what is probably zinc oxide, and, in addition, reveal that the coat consists of a zinc oxide and zinc sponge sandwiched between two layers of zinc oxide. In every case there is a film of what appears to be zinc oxide separating the coat from its base. This accounts for the fact that bending and compression causes the film of zinc to separate rather easily from the wire, and it also accounts for the peculiar feature noted in the stripping tests, of the last shell of zinc falling away from the surface of the wire.

Photo-micrograph (fig. 9) magnified to 1,000 diameters, shows the formation of the electro-galvanised coat in a deep surface fissure or roake in the steel base. It will be observed that the line of the coat follows the fissure, and, as a consequence, a pocket is left, which will collect moisture and form a weak point in the protection.

I tried very hard to find a similar sample in the hot-galvanised wire, but nothing quite so severe as this particular surface fissure could be discovered. In the photo-micrograph of the 12-gauge hot galvanised wire, however, it will be observed that there is a surface flaw and that this has been completely filled with the coat and no point of weakness is left.

It is evident that in the electro-galvanised wire oxidation of the coat is already well advanced when the material leaves the works, and, moreover, this oxidation has taken place from underneath the coat as well as from the surface.

It may be noted that in the determinations of coat percentage given above, the results represent zinc plus zinc oxide or other impurity. In the hot-galvanised samples similarly the results represent zinc plus zinc-iron alloy. On the face of it it would seem that a hot-galvanised coat consisting of an underlayer of zinc-iron alloy and an outer layer of substantially pure zinc is a better protection against any form of corrosion than the electro-galvanised coat where the zinc is honeycombed with inclusions of zinc oxide and other impurities, and is in addition of a laminated character.

In hot galvanising I attach the greatest importance to the zinc-iron alloy layer. This forms a compact and firm bond between the steel base and the outer zinc coat, and it is not possible for any inclusion of impurities to occur between it and the steel base. The results of the Preece test, after wrapping and unwrapping the wire round its own diameter, demonstrate clearly that this under coat is not brittle. If such were the case the whole coat would become detached under the wrapping test, or, on the other hand, the under coat would be fractured and the wire would stand few, if any, dips after being unwrapped.

Tests

THE question of testing galvanised wire is one of extreme difficulty. No form of accelerated corrosion test yet devised can reproduce the many and constantly varying conditions of atmospheric corrosion.

The salt spray test is perhaps of some value for research purposes, but it cannot be argued that it represents even approximately the conditions under which any galvanised wire would be exposed. For practical purposes it is of no use, since it takes too long to perform, and for another, no standard apparatus of procedure for carrying out the test has yet been laid down.

For commercial purposes, therefore, it would seem that at present tests are most usefully confined to those proving the ductility and adhesion of the coat and giving some indication of its quantity. The ductility and adhesion of the coat is simply ascertained by wrapping the wire round a mandrel of a specified diameter. This test is called for in most standard specifications, but under modern conditions of hot galvanising the severity of the test can be increased by unwrapping the wire and then subjecting it to the Preece test.

This test has been adopted by the Central Electricity Board for galvanised wires used in steel-cored aluminum conductors. The Preece test will give some indication of the weight of coat, but it lacks reliability in this respect, since different results can be obtained from coats of the same weight in different conditions. I do not agree with your contributor that the results of the Preece test are largely dependent on the opinion and experience of the observer. If the test is carried out in a proper manner the end-point of it is quite obvious.

An alternative test for determining the weight of coat would be the time-stripping test in a specified solution of acid. If during the test the volume of hydrogen evolved is measured, a fairly accurate estimation of the amount of metallic zinc present could be secured. By this method, of course, zinc in the form of zinc oxide would not be measured. The whole question of wire galvanising is one of extreme importance and no useful purpose is served in making extravagant claims for this process or that. The leading wire manufacturers in this country, after considerable research and experiment with all types of

(*Please turn to page 344*)

'Round the World With the Wire Industry

Wire Rod Cartel to Continue Throughout Year

THE International Wire Rod Cartel has at last succeeded in reconciling the conflicting claims of certain of its members, and will, therefore, be continued until the end of the current year at least. The importance of this lies in the fact that while France, Luxembourg, and Germany were bound under the original agreement to continue their membership until the end of December next, Belgium had the option of withdrawing on June 30, and, in view of certain differences which had arisen within the Belgian group, withdrawal at one time appeared not unlikely. In such an event the syndicate would have been dissolved.

Evidently a way out of the Belgian problem has been discovered, but though the syndicate is secure until December 31, the outlook after that date is by no means certain. There is no doubt that negotiations for a long-term renewal will be started before the end of the year. The position is rendered more complicated by the growth of native industries in countries which have hitherto been important importers. Japan, for example, now produces enough wire rod to supply her entire domestic demand, whereas hitherto she imported substantial tonnages each year. Notwithstanding the generally depressed conditions of industry, the syndicate has decided that prices shall be maintained unaltered for the current quarter on the basis of £5 10s. ($27.50) per ton f. o. b., and in addition to make no alteration in the tonnage program, which now stands at 390,000 tons, as against a quota of 500,000 tons for the corresponding quarter of last year.

The results of the syndicate's deliberations at the end of the year will be awaited with the keenest interest.

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THE Indian demand for wire in short lengths, used for the production of different kinds of nails, shows an increasing tendency. The small works in India, in spite of low nail prices, are able to retain a competitive position owing to low wages. The imports of short lengths of wire could be increased, more especially in Southern India via Madras. Quantities up to 100 tons of plain wire in lengths of 3 to 10 ft. are bought. The United States and Belgium between them are securing half of the business. Japan and Great Britain are also sending increased quantities.

✦ ✦ ✦

German View of Wire Rod Cartel

ALTHOUGH the continental wire rod cartel has left unchanged the official price for wire rods, it was nevertheless necessary to reduce the price to £4.17.6 and even 4.16.0 f. o. b. The prices for export to North America and the Far East are also slightly lower.

An effort is being made by all European wire makers and exporters including the British industry to establish uniform conditions for all Companies with certain overseas markets, especially the Far East, India and East Africa. In times of declining prices rejects of wire shipments to these markets are very frequent, and therefore it would be of immense value if the sellers could agree upon equal terms of payment and delivery for all these markets. A committee appointed by the industries and merchants in the various countries will meet and discuss these terms and conditions. It is hoped to be able by a joint cooperation to avoid the frequent losses in these countries. The main question and the most difficult is of course to agree upon the terms of payment.

The Belgian and the German wire cartels have agreed to sell most of the wire products at equal prices. This agreement is apparently working well, since the prices, which had been fixed by both industries are being maintained. The Belgian outsiders, which are the Tréfileries et Cloutéries de la Paix et the Tréfileries et Cloutéries de Flandres have not yet joined the cartel, but at the moment both works are fully booked with orders and are unable to accept more business, so it is hardly possible to buy below these prices, until the outsiders, which have together a capacity of some 2,700 tons of wire products monthly, reappear on the markets. A meeting will take place at the end of June with these outsiders.

✦ ✦ ✦

German Exports Satisfactory

GERMANY exported in April 27,575 tons wire products and 4.531 tons wire nails compared with 31.409 tons and 3.918 tons last year. During the first 4 months 102. 817 t (119.284 tons wire products and 19.926 (18.703 t) wire nails were sold for export.

The export business in non ferrous metal wire products is quite satisfactory at present, especially in copper wires, for which the German works booked recently very heavy orders, especially for the British Empire and the Argentine Republic. Business in brass wires is not as satisfactory and in aluminum wires very bad, but more lead wire was exported this year than last year. Italian competition in all non ferrous wire is very keen.

✦ ✦ ✦

Trade Mark For British Steel

BRITISH steel of the quality set up by the British Standards Association, under its specification for structural steel No. 15 (1930), will bear a specially adopted mark "British Steel."

The new mark has already been cut in the rolls of some of the makers of joists and it is expected that by the end of the year all the output, including plates and sheets of the rolling mills capable of being marked, will bear this clear and definite indication of origin.

A Review of Recent Wire Patents

No. 1,807,628, METHOD OF MAKING A SEAM FOR WOVEN WIRE BELTS. Patented June 2, 1931, by Hamilton Lindsay, of Shaker Heights, Ohio, Assignor to The Lindsay Wire Weaving Company, of Cleveland, Ohio, a Corporation of Ohio. This belt is one adapted for use on a fibre board machine, and the method consists in first temporarily fastening a mandrel wire to each end of the fabric and across substantially the entire width, passing a stitch-forming wire around each mandrel wire and back into the fabric, withdrawing each mandrel wire whereby loops project from each end of the fabric, bringing the ends together and interfitting the loops, and then passing a connecting wire smaller than the mandrel wire through the passageway.

✦ ✦ ✦

No. 1,809,144, APPARATUS FOR COVERING ROLLS WITH TOOTHED WIRE, Patented June 9, 1931 by James A. Noonan, of Lowell, Massachusetts, Assignor to C. G. Sargent's Sons Corporation, of Graniteville, Massachusetts, a Corporation of Massachusetts. The principal objects of the invention are to provide mechanism whereby cylindrical ungrooved rolls may be covered with toothed wire which has a rectangular cross section, with its height materially greater than its width, also to provide means whereby each strand of wire as it is wound will be held against the next strand firmly but yieldingly so that it will not get out of place or tip over, and to provide means so that the hammering of the strands together will be eliminated.

✦ ✦ ✦

No. 1,810,499, TRANSFORMER WINDING WIRE, Patented June 16, 1931, by Johan Romp, of Eindhoven, Netherlands, Assignor to Radio Corporation of America, a Corporation of Delaware. The core of the wire of at least one of the windings consists of a copper-silver alloy which contains a small percentage of silver, this core being surrounded by a sheath of silver, and this insulated by an enamel coating.

✦ ✦ ✦

No. 1,812,611, MACHINE AND METHOD FOR ASSEMBLING SPRINGS, Patented June 30, 1931, by George A. Stackhouse of Oakland, California, Assignor to L. A. Young Spring & Wire Corporation, of Detroit, Michigan. The method of assembling helical springs having end coils terminating in laterally disclosed time members and also having offsets in the end coils opposite the tie members, consists of wrapping the tie members about the offsets of adjacent springs in open spiral coils, disposing the offsets of the connected springs in a chuck with the reaches of their offsets in alined relation, the chucks having spiral grooves therein, and rotating and advancing a spiral spring cross member in said chuck whereby it is engaged with the said offsets, the coils of the time member being spaced to receive the coils of the cross member between them.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 551 Fifth Avenue, New York.

No. 1,811,897, METHOD OF AND APPARATUS FOR FORMING CABLES, Patented June 30, 1931, by Ernest Martin Runquist, of Cicero, and Thornton McDuffey Yancey, of Oak Park, Illinois, Assignors to Western Electric Company, Incorporated, of New York, N. Y., a Corporation of New York. The method of forming flat cable, particularly for telephone exchange use and the like, consists in advancing a number of strands in spaced lateral relation to each other, converging the strands into a flat formation by exerting opposite lateral pressures against the strands while imparting a twist to the formation, and consolidating the formation by exerting opposite lateral pressures thereagainst at an angle to the first mentioned lateral pressures and at a point longitudinally removed along the cable from the first lateral pressures exerted.

✦ ✦ ✦

No. 1,811,098, MACHINE FOR UNDULATING WIRE, Patented June 23, 1931, by Casamiro Hernandez Sola, of Barcelona, Spain. The inventor aims to provide a wire fence or trellis which will be wholly flat, the portions where the wires cross being undulated in a plane at right angles to that containing the ornamental undulations. The machine comprises a first pair of cooperating rotatable discs arranged in one plane, between which the wire passes so as to form the undulations in one plane, and a second pair of discs, separated from the first, arranged in the second plane, between which the wire passes after leaving the first pair.

✦ ✦ ✦

No. 1,811,511, METHOD OF FORMING WIRE FENCE FABRIC, Patented June 23, 1931, by Frank Mafera, of Revere, Massachusetts. In the manufacture of this wire fence fabric, the selvage is devoid of projections, and the method consists of bending the terminal end portions of related pairs of the strands of the fencing into aligned end-to-end abutting relation, and welding the end portions together.

✦ ✦ ✦

No. 1,809,032, STRANDING MACHINE HEAD, Patented June 9, 1931, by George C. Gregson, of Belleville, New Jersey, Assignor to American Cable Company, a Corporation of Delaware. This invention relates to the fabrication of stranded wire rope and the like, and covers a forming head, adapted to set each of the components of such a stranded wire rope or the like to the form which each is to occupy in the completed wire structure, the purpose of such pre-formation being to produce a structure having the characteristics of inert lay, so that the parts will not tend to unravel when the strand or the like is severed.

No. 1,812,630, CABLE ARMORING, Patented June 30, 1931, by John J. Gilbert, of Douglaston, New York, Assignor to Bell Telephone Laboratories, Inc., of New York, a Corporation of New York. This invention involves a submarine signalling cable having stranded armor wires with each wire impregnated with an insulating compound and tape.

✦ ✦ ✦

No. 1,811,585, WIRE WELDING MACHINE, Patented June 23, 1931, by Thomas Henry Kane, of Youngstown, Ohio, Assignor to Truscon Steel Company, of Youngstown, Ohio, a Corporation of Michigan. For the production of wire meshwork or fencing, the inventor has produced a machine in which the common feeding means is provided for feeding both the longitudinal wires and the cross wires past the welding electrodes, and in which the welding electrodes are mounted to travel with the crossed wires during the welding operation, and in which provision is made for operating the electrodes so that successive cross wires engage the electrode surfaces at different places in order to distribute the wear on the electrodes.

✦ ✦ ✦

No. 1,811,697, WIRE ROPE, Patented June 23, 1931, by Frank Ward Reilly, of Chattanooga, Tennessee, Assignor to Williamsport Wire Rope Company, a Corporation of Pennsylvania. For use particularly in oil well drilling, the wire rope here patented is so constructed and arranged so that the seepage or leakage of oil into which the rope may be immersed will not be upward within the rope. There are inner and outer strand groups, with a liquid-proof packing between the inner and outer strand groups.

✦ ✦ ✦

No. 1,808,526, WIRE CLOTH SELVAGE, Patented June 2, 1931, by Leggett C. Campbell, of Newark, New Jersey, Assignor to Newark Wire Cloth Company, of Newark, New Jersey, a Corporation of New Jersey. The invention is particularly adapted to the narrow wire cloth employed in making screen grids for radio tubes, and the selvage is formed by bending the ends of the weft wires into a curve through an angle of not more than 90° toward the next weft wire, so that the ends are in a plane, thus forming a point at the wire's end.

✦ ✦ ✦

No. 1,809,011, INSULATED ELECTRICAL CONDUCTOR, Patented June 9, 1931, by Charles A. Barker, of Highland Park, New Jersey, Assignor to E. I. duPont de Nemoures & Company, of Wilmington, Delaware, a Corporation of Delaware. This is a high-voltage electrical conductor having upon the surface thereof a plastic, ozone- and corona-proof, non-inflammable, insulating coating of substantial thickness comprising 26% nitrocellulose, 39% tricresyl phosphate, 14% gypsum, and 14% zinc oxide.

Exports and Imports of Wire

Exports of iron and steel wire products in April and May, 1931
(In gross tons)

	May 1931	April 1931	May 1930
Wire rods	4,532	3,239	4,535
Hoops, bands and strips	3,066	3,148	4,611
Plain wire, iron or steel	1,181	1,482	2,664
Barbed w're and woven wire fencing	3,028	2,639	4,462
Woven wire screen cloth	86	84	152
Wire rope	254	279	527
Insulated wire and cable	18	33	34
Other wire and manufactures	345	434	634
Wire nails	585	810	623
Nails other than wire	288	312	632
Tacks	35	50	40
Bolts, nuts, rivets, except track	495	576	987
Total, these 12 classifications	13,913	13,086	19,951

Imports of iron and steel wire and wire products into the United States
(In gross tons)

Wire rod	669	655	490
Concrete reinforcement and other bars	6,074	9,630	3,101
Barbed wire	606	499	283
Round iron and steel wire	258	265	829
Steel telegraph and telephone wire		1	1
Flat wire and strip steel	48	62	110
Wire rope and strand	160	209	248
Hoops and bands	1,390	1,921	2,098
Other wire	16	63	5
Nails, tacks and staples	750	508	229
Bolts, nuts, rivets and washers	72	46	59
Total, these 11 classifications	10,043	13,859	7,453

THE volume of both the export and import trades of the United States in iron and steel products was lower in May than in April. Exports totaling 91,407 gross tons, were 9,674 tons under the April figure, while imports, at 37,176 tons, were 10,696 tons lower.

Canada took 42,970 tons of United States steel during May—47 per cent of all exports in that month.

The iron and steel wood-screw trade declined to 140,976 gross, valued at $19,624, and those of brass wood screws to 9,384 tons, valued at $3,136.

BELGIUM continued to be the chief source of imports, supplying a total of 10,896 tons, including 2,343 tons of concrete reinforcement bars, 1,415 tons of ingots, and 1,284 tons of merchant steel bars.

The trade from France amounted to 3,584 tons and included 949 tons of concrete reinforcement bars. The Canadian trade of 3,444 tons included 1,497 tons of scrap and 1,220 of ferro-manganese.

RECEIPTS of card clothing—19,784 square feet, valued at $29,306—for the second month doubled the imports of the month preceding. The United Kingdom supplied 19,075 square feet ($27,632). Imports of wire cloth screening increased to 24,975 square feet, with Germany, Canada, the Netherlands and France the chief sources of supply. Receipts of Fourdrinier and other paper-making wires totaled 43,144 square feet, 29,643 square feet of which originated in France, and lesser quantities from Germany, Sweden, Canada and Spain.

Wire heddle imports rose to 1,893,000 pieces, of which 1,525,000 originated in France, 273,000 in Germany, and the rest in Switzerland. The trade in wood screws rose sharply to total 16,181 gross, valued at $1,492—10,495 gross ($591) coming from Sweden, 3,211 gross ($222) from Germany, and 2,475 gross ($319) from the Netherlands. The largest single French exports of iron and steel in April included 121,807 tons of bars approximately 33,000 tons more than in March. The trade

(Please turn to page 344)

"HANDY" SILVER SOLDERS

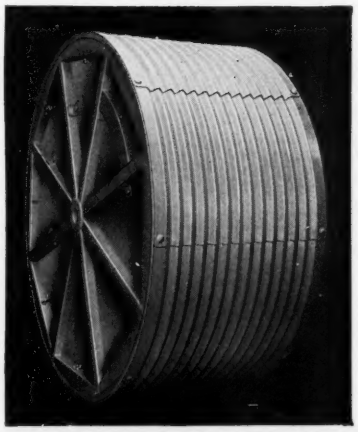
are ideal for splicing copper, brass or other non-ferrous wire and rods.

Dependably uniform in analysis and working characteristics.

Send for Bulletin No. 8ww

HANDY & HARMAN
57 William St., New York

RED HEAD STEEL REEL



HOLDS reel costs 'way down by fewer repairs, smaller reserve, lowered freight, decreased cable damage. Withstands many times force that destroys wood reels. Made in all sizes. Write for interesting report of tests and description of construction.

R. B. HAYWARD CO.
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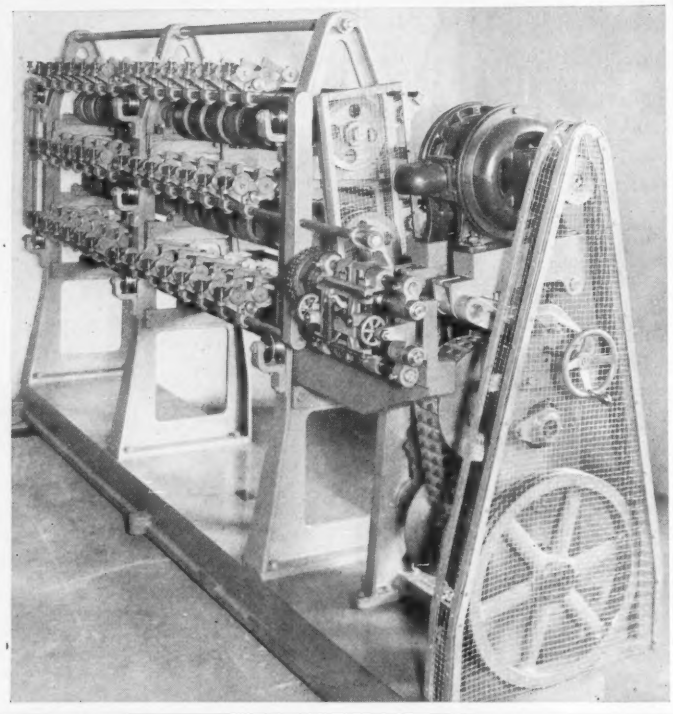
Rod, Wire, Cable, Strip and Tube Machinery



42 Wire Spooler
For Use With Multi-Strand Bright Annealing Furnace

WE BUILD

Chain Draw Benches—Multiple Coil Winders.
Flat Wire Rolling Mills—Rod Pointers.
Hollow Wire Straighteners and Equipment.
Multiple Strand Bright Annealing Units.
Stranders to Customers' Specifications.
Reelers and Spoolers for all sizes of Wire and Cable.
Reelers and Spoolers for Tinning, Galvanizing, Patenting and Annealing.

Frederick M. Conran

Designer and Builder of Special Machinery

107 Colden St., Newark, N. J.

Voice Pictures Recorded On Wire Spool

A remarkable invention for reproducing sounds that has been justly described as the "eighth wonder of the world" is now being used by the British Broadcasting Corporation, and the Brixton Astoria and several other London theaters, with results that promise an imminent revolution in the field of sound recording and reproduction. This apparatus, the Blattner "Stillephone," in its present form, is the work of Dr. Stille, a German scientist.

It is based on the fact that sounds can be electrically recorded on a strip of metal passing between electro-magnets. The process causes a definite change, not fully understood, in the molecular structure of the metal, which remains in that state until it again meets a magnet, when it reverts, apparently, to its original condition and can be used for fresh recording. The sound is recorded on a thin metal wire which rolls on a spool and is portable, unbreakable, and unwearable.

The British Broadcasting Corporation has been using the device for rehearsals, for the recording of special program items, and for special speeches, such as those made by the Prince of Wales. The sounds recorded can be reproduced immediately. At a press demonstration held in London recently a reporter recorded a speech in the process and in less than one-half minute had the unusual experience of hearing it come back to him without any overtones, undertones, scratchiness, or extraneous noises of any kind.

✦ ✦ ✦

Gold Coast Manganese

Out of a total world's supply of 3,595,800 tons of manganese in the year 1929, the Gold Coast contributed 503,000 tons, the Union of South Africa supplied 59,500 tons and Egypt 191,500 tons.

Steps are being taken by the African Manganese Company, to restrict the output thirty per cent in the coming year.

Doing Business With India

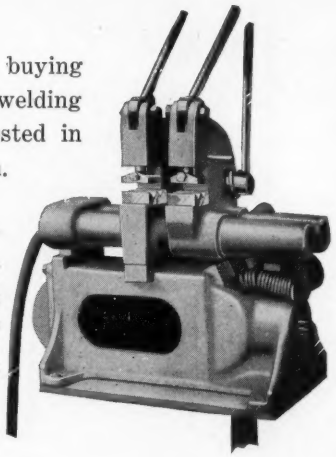
INDIA is one of the best customers for wire and wire products. In the last month however, refusals of acceptance of goods shipped to India show an increasing tendency. In most cases the difficulty has been in delayed deliveries. Very often refusals are caused by improper wrapping, a variation in quality, etc. A great deal of reclamations might be prevented if suppliers would have better knowledge of the requirements of the Indian market. First, it is important to have direct agents or brokers in India, who in case of differences are able to examine the goods. If the customer knows that the shipper is standing behind a well informed Indian agent he will be more careful in refusing goods. It is advisable to know something about the Indian customer. A great many buyers try to obtain discounts by refusing the goods. It is always best to entrust the Bank with full power, because they have a good knowledge of the individual importers.

Regarding terms of delivery makers have to be very careful. In most cases no dates are named regarding the time of shipment, like the end of May or June, but approximate shipping times are given as for example: shipment within 4 to 6 weeks. The Indian buyer counts from the day of giving the order. Sellers receive the order, if it is not cabled, after two or three weeks, so that the material would have to be shipped within 2 or 3 weeks. Generally, it is impossible to ship the goods within this time. If the buyer notices that the material was not shipped within 4-6 weeks after giving the order, but a time of 8-10 weeks was required, he is at liberty to refuse acceptance. For this reason it is important to examine precisely the terms of time of delivery. In any business done with Indian customers, a tolerance in time has to be fixed, running between 2 and 4 weeks, whichever condition will mostly find acceptance by Indian buyers. It is also advisable to elect an arbitration

(*Please turn to page 347*)

"What Is The Best Welding Machine Buy?"

If you are at all interested in buying electric butt-welding or spot-welding equipment, you are keenly interested in the right answer to that question.



Now, frankly, until we know a little about your specific requirements, we're not going to insist that our products are the BEST for YOU; but we do know that

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Spot Welders

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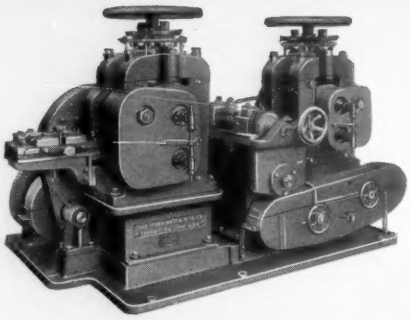
are (1) newer in design; (2) more efficient in operation; (3) more economical in current costs; (4) more compact in size; (5) ideal for work on very small stock (MICRO-WELD denotes precision and precision describes its construction and the work it does) (6) its price allows it to be bought in quantities for quality-production work and (7) others have already proven that it was "the best buy" for them!

If you will let us know your own requirements, we will gladly send your full details regarding MICROWELD and the work it is doing for others.

Micro Products Company

140 Industrial Street **Peoria, Ill.**

European Office: H. A. Schlatter & Co. Zurich 1, Limmatquai 32, Switzerland.



B-1193
FLAT WIRE MILL

A three stand tandem rolling mill for producing flat wire with round edges or round corners from round rod. The mill successively flattens round edges and finish rolls round wire with subsequent traverse winding on a received reel stand or take-up.

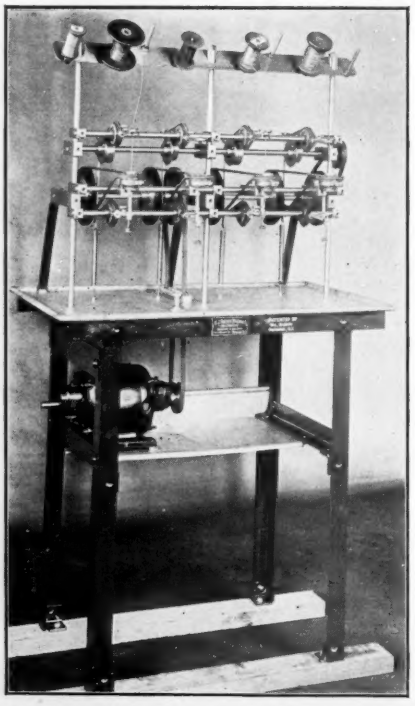
Drive by 50 HP adjustable speed motor with slip frictions adjustable while running to accommodate intermediate speeds to wire elongation.

A complete set of guides incorporated in the design including a quickly operated guide to straighten the entering coil.

Linear speed 150-450 feet per minute.

The Torrington Mfg. Co.
Torrington - Conn, U.S.A.
44 Franklin St.

The Haddow Die Re-Cutting and Polishing Machine will lower your die re-cutting cost to a fraction of present costs



Why do you continue to pay a die cutter and pay for diamond dust to remove a large percentage of your diamond from your dies? Diamond that has done no work—when, by the use of the Haddow Die Recutting Machine you may use practically all your diamonds to draw wire, especially in the small sizes.

ONE MONTH'S SHOP PRODUCTION

Total number of dies cut —1047

Total number of hours required—182.5

Average number of dies per hour—5.73

Number of operators—1

With only one man—This machine will do the work now requiring four to six men in less time and at lower cost.

4 HEAD MACHINE—Also Made in 6-Head size (With 2 Heads for Heavier Dies).

WILLIAM HADDOW
17 Eastern Ave.
Ossining, N. Y.

Modern Rod Baking Discussion of Paper

CHAIRMAN MORDICA:

Mr. Coulter will be glad to answer any questions you want to ask.

MR. LEWIS: I should like to ask Mr. Coulter if, in his experience, he has found that rods when baked in the rapidly moving current can be baked at a lower temperature in the same amount of time; or, let us say, a shorter time for the same amount of temperature. In other words, is a rapidly flowing current of air more effective?

MR. COULTER: I would say it was, on account of the fact that the work to be done is a dehydrization or gaseous removal, and that is more rapidly done by a rapidly moving current than a slowly moving one. I have no figures with which to back that up, but it seems that would be the logical conclusion to come to.

MR. LEWIS: I suspect you are right. I have suspected it for several years. One of my customers in Europe when he changed from wet to dry drawing followed my advice in almost every detail, but in baking he just ran wild. He put in such a furnace as you described, with a separate heat transmitter mounted on the top of the baker, and against my urging, almost pleading, put in a system of steam pipes, carrying super-heated steam, and blew his air through the steam pipes. I didn't see how he could get much more than 220 or 230 degrees in the furnace; in fact, it felt about like Palm Beach in there, but that fellow bakes from an hour and a half to two hours and his rods go to 18, 19, 20-gauge without annealing, but very heavy drafting, and the results are certainly surprisingly good.

I suspect you can bake either at a lower temperature at the same time, or a shorter time, with the same temperature, with very rapid circulation.

MR. COULTER: I think it is very unfortunate we have so little data on that particular subject.

There is very little obtainable; those who operate rod bakers either won't tell you or else they have not catalogued the information they have.

MR. LEWIS: I don't think many of us know much about baking temperatures and the reason is that the capacity of the baker, that is, the output of the baker, is generally the capacity divided by how much he uses. In other words, the baker is a very satisfactory storing place. I know there are a half dozen members in this Association whose mills have expanded and outgrown their baking capacity and who have been forced to experiment with temperature and length of time of baking and poor circulation. Some of those birds know something, but I don't know if they will give it up. I wish Mr. Brown could work on that, have a department or column for it.

MR. R. B. WHYTE (MacWhyte Company): Our experience with the baker of the type that Mr. Coulter speaks of is that with the same temperature we bake a great deal more rapidly. Now it is a very hard thing to get tests on a thing like that, because the real thing you are after is to bake wire enough so that it draws well and passes the test, but you can't draw a sharp line on baking as you can on other things as to what that time limit is, but from actual experience we know that we have cut our baking time down from one-half to one-third of what it should otherwise have been.

CHAIRMAN MORDICA: Do you attribute that to the passing of the heat in cutting that down?

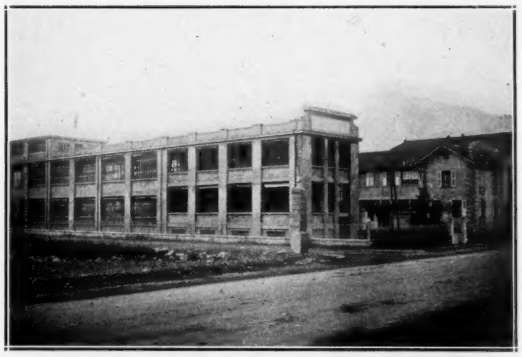
MR. WHYTE: It is very hard to say. You get inhibitors along with that and it is very hard to say how much of the saving you can attribute to each one of these steps we have gradually been bringing in. It is one of those peculiar things you can't measure the definite stopping-off point; you can measure temperatures, the time in there, but whether you left it too long or too little is a hard thing to say.

Now regarding the use of the baker for storage, what we have done is this. We have kept our baking capacity down in order to get the best fuel economy, and

BALLOFFET

1870 — 1931

The Quality Diamond Dies



Balloffet Diamond Wire Dies Co., Inc.

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Successors Royle & Akin

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Copper Wire Specially Processed for Enameling Purposes

Copper	Lead
High Brass	Zinc
Low Brass	Commercial Bronze
Pure Tin	Phosphor Bronze
Cadmium	Silver Plated Copper
Bronze, Various Grades	False Gold

10%, 18%, 30% Nickel Silver

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False Gold Copper Silver Plated Copper

BRUSH WIRES CRIMP and STRAIGHT

Brass Copper

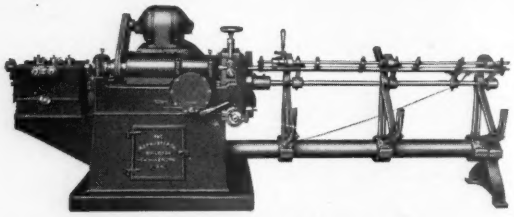
Steel Nickel Silver

Phosphor Bronze

Metallic Fibre for Packing Purposes

Straighten and Cut Your Wire on

SHUSTER AUTOMATIC WIRE STRAIGHTENING & CUTTING MACHINES



for profits. They are easy to adjust and operate—up to date in every way. Geared for HIGH SPEED.

Steel Fliers, Timken Roller Bearings and other patented features.

Catalogue No. 30?

The F. B. Shuster Company, New Haven, Conn.

Straightener Specialists Since 1866

VIANNEY

DIAMOND DIES

100 FIFTH AVE · NEW YORK

LEWIS

HIGH SPEED HEAVY DUTY

Wire Straightening and Cutting Machines

Write for Bulletin on New High Production Machines

THE LEWIS MACHINE CO.

1603 E. 24th St., Cleveland, Ohio

then for our fine sized wires, we come along Lake Michigan where we get quite a bit of moisture and we have what we call a warm room, so we just store our wire there until it is ready to go to the frames, and that is especially true over the week-ends.

MR. LEWIS: How about this for a theory? With regard to this rapid stream of air, it just came into my head (I have not had time to see if it is any good, but I just throw it out for discussion) that last year, you remember, when I talked before this Association about some practices in Europe I told about the fellow who would run a brass pipe across the bottom of the cleaning tube and force air through to get a violent agitation of his acid, and how he cut his time down, the reason being that as the hydrogen bubbles form on the acid they are immediately swept off, and don't stay there to prevent the acid from further attacking the steel, and are swept off so the acid can attack the steel immediately again and thereby there was tremendous increase in cleaning?

I wonder if the hydrogen bubbles that ooze out of these rods during the baking tend to cling to the surface and are perhaps swept off by this rapid current of air.

MR. COULTER: I don't think there is any question that is true.

CHAIRMAN MORDICA: Of course those things bring up a lot of questions. I remember Mr. Lewis' talking about this before, and since I have tried it out and we discontinued it, I will state the reason: the people who tried it were in the habit of using an inhibitor and the air drove the air up along it so the center of the tubes was bare, which possibly wouldn't do any harm—I don't know. I don't know if that destroyed the effect of the inhibitor or not, but the men who worked in this particular place objected very much to that because they didn't have as good control over the tubes. I don't know if there is anything to that or not.

✦ ✦ ✦

The second paper on Automatic Combustion Control Systems will appear in September.

New Plant of Canadian Copper Refiners Started

THE new $3,000,000 copper refinery of Canadian Copper Refiner, Ltd., and the new $1,000,000 wire plant of Canada Wire & Cable Company, Ltd., adjoining were opened at East Montreal recently. Canadian Copper Refiners is jointly owned by Noranda Mines, Ltd., British Metals Corporation, (Canada) Ltd., and Nichols Copper Company with Noranda holding controlling interest and Nichols Copper as refinery managers. Noranda also has a substantial stock interest in Canada Wire & Cable.

The refinery has a capacity of about 75,000 tons of copper a year, and about 720,000 ounces of silver annually. The Canada Wire plant is capable of producing 80,000,000 pounds of copper wire annually.

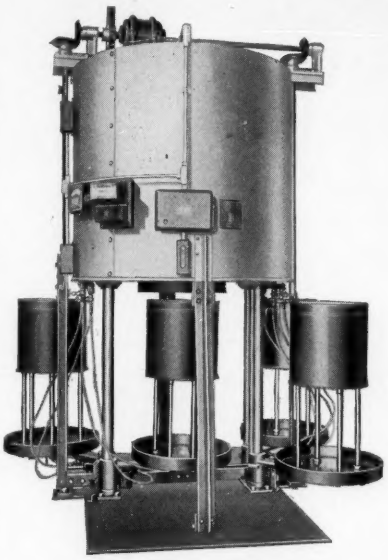
✦ ✦ ✦

Institute of Metals Meeting

THE Institute of Metals of London, announced that the Autumn meeting will be held September 13th to 18th, 1931, at Zürich, Switzerland. The headquarters of the Institute and office of the Secretary will be at the Savoy Hotel. The meetings will be held at the Federal Polytechnic. Preceding the meeting there will be held at Zürich, from September 6th to 12th, the first Congress of the New International Association for Testing Materials, and following the meeting, optional tours will be made to Lucerne, Thun, Biel (Bienne), and Chippis-Siders (Sierre). The outline of the meeting and full information regarding travel conditions can be obtained by addressing the Secretary of the Institute, G. Shaw Scott, 36 Victoria Stree, London, S. W. 1, England.

✦ ✦ ✦

DURING 1928/30 55 American patents were granted to German inventors for improved or new wire machinery, parts, accessories or production methods of wires.



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Wire Screen Cloth Simplified Practice

THE division of simplified practice of the National Bureau of Standards, Department of Commerce, recently announced that a general conference of all interests held in New York, N. Y., on June 18, 1931, approved a simplified practice recommendation covering wire screen cloth.

The simplification program considers the mesh, wire size, width and length of roll, and method of packing steel wire screen cloth, and bronze and copper wire screen cloth.

The recommendation will be effective one month after the Department's letter announcing the receipt of the required degree of acceptance.

✦ ✦ ✦

Fourdrinier Wire Standardization

A RECOMMENDED commercial standard for fourdrinier wire has been mailed by the Division of Trade Standards, Bureau of Standards, to all manufacturers as well as users of fourdrinier wire cloth. The proposed standard covers physical requirements for wire before weaving and wire cloth after weaving, the seam and method of inspection.

✦ ✦ ✦

1930 Report of American Iron and Steel Institute

THE annual statistical report of the American Iron & Steel Institute for 1930 has just been published. It contains full and complete statistics of the iron and steel industry for the United States and Canada for 1930 and prior years; also foreign statistics for leading countries for iron, ore, pig iron and ferro-alloys, and steel ingots and castings from 1905 to 1930 so far as available; also an analysis of the tonnage of iron and steel products exported, showing exports for the years 1926-1930, inclusive, to certain countries and by geographical division.

The report contains 126 pages, the price, bound in cloth, is $5.00 per copy.

Low Melting Point Brazing Alloy

HANDY & HARMAN of 57 William Street, New York, producers of sterling silver sheet metal and wire, silver solders and silver alloys in general, have applied for a patent on a new brazing alloy which they call "SIL-FOS". It contains a small percentage of silver and is described as flowing freely at 1300°F.

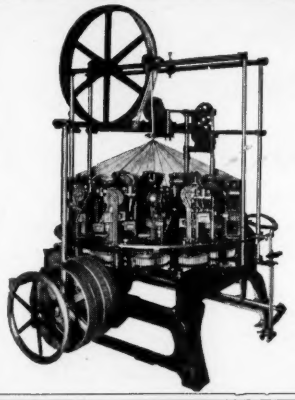
"SIL-FOS" promises to be worthy of consideration where higher melting point base-metal brazing or welding alloys cannot be used without danger of weakening, distorting or destroying the parts adjacent to the joint. When it is remembered that the commercial silver solders containing 50% silver, or less, require 1400° to 1600°F. to melt and the base-metal brazing alloys from 1600° to 2100°F., part of the importance of this Handy & Harman research development can be realized.

"SIL-FOS" is described as also possessing free-flowing properties, with deep and quick penetration. This characteristic is doubtless due to the silver in the alloy. In addition, it is pointed out that at 1400°F., the flow point of borax flux with which it is generally applied, there is 100° of superheat which increases the fluidity still further and aids penetration and alloying action.

Another interesting feature claimed is that it requires less than the usual amount of flux because of the deoxidizing effect of the phosphorous in the alloy. This would seem to be an important advantage and should tend to reduce the cost of cleaning and finishing after joints have been made. Under certain conditions, satisfactory copper to copper joints can be made without using any flux.

As to strength, the makers report, for example, that lap joints of copper sheets show tensile strength of approximately 30,000 pounds per square inch. They also inform us that "SIL-FOS" can be used for joining brass, bronze, nickel, nickel-silver, extruded

(*Please turn to page 345*)



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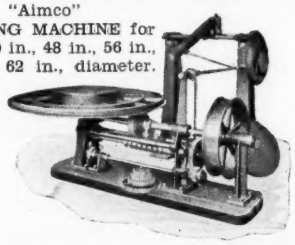
AUTOMATICALLY places RUBBER COVERED WIRE in sheet metal pans for vulcanization, SAVES WAGES OF AN OPERATOR and INCREASES PRODUCTION SPEED of Tubing Machine 25% to 50%.

"Aimco" PANNING MACHINE for pans 40 in., 48 in., 56 in., 60 in., 62 in., diameter.



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COMPOSITION DIES

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New York Office 315 Fifth Ave.

(*Continued from page 332*)

galvanising, have adopted the well-known Crapo Process. I am sure that none of them regard it as perfect, but the fact that its adoption is an advance along the road to perfection is demonstrated by the results of the tests on the hot-galvanised samples set out in this article.*

*Reproduced in the United States by permission of the Ironmonger; Rylands Bros., Ltd., and Whitehead, Hill & Co., Ltd.

✦ ✦ ✦

(*Continued from page 335*)

in ingots, billets, and blooms was 36,881 tons wire rods, 10,916 tons; hot and cold rolled strips, 8,705 tons; wire of all kinds, 4,633 tons.

IMPORTS of wire fencing and netting, galvanized before weaving, totaled 863,525 square feet, four fifths of which came from Germany and the rest from the Netherlands. Receipts of this same material, but galvanized after weaving, totaled 4,490,035 square feet, the Netherlands supplying 2,297,250 square feet, Germany 1,666,285 square feet, and Belgium the remainder.

The Waterbury Wire Die Co.

Diamond, Composition and CHILLED IRON DIES

Waterbury, Conn.

Low Melting Point Brazing Alloy

(*Continued from page 343*)

brass and bronze, monel metal, and alloys fusing above 1300°F.

While containing silver, "SIL-FOS" is not classed as a silver solder by its makers. It is sold by the avoirdupois pound rather than by the troy ounce, as are silver solders usually. The low prices, combined with the small quantity necessary for tight fitting joints, and the speed with which the brazing is done, make "SIL-FOS" brazing economical.

✦ ✦ ✦

The South Works of the American Steel & Wire Company, at Worcester, Mass., U. S. Steel Corp. subsidiary, made the best no-lost-time record in the State in 1930, having won the inter-plant safety contest conducted under the auspices of Safety Council. The plant went almost 4,000,000 working hours without a disabling accident.

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See Furnaces—Various Headings

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Vaughn Machinery Co., Cuyahoga Falls, O.

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BRAIDER CARRIERS
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CLEANING & PICKLING EQUIPMENT
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COPHOLDERS
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Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Chilled Iron
Waterbury Wire Die Co., Waterbury, Ct.

DIES—Composition
Addor Wire Die Works, N. Y.
Bellet Diamond Die Works, N. Y.
F. Krause, Inc., Jersey City, N. J.
Urdika Wire Die Works, Inc., New York
Vianney Wire Die Works, New York, N. Y.

DIES—Diamond
Addor Wire Die Works, N. Y.
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Bellet Diamond Die Works, N. Y.
Cochaud Wire Die Co., New York.
Detroit Wire Die Co., Detroit, Mich.
Driver-Harris Co., Harrison, N. J.
Koebel Wagner Diamond Corp., Newark, N. J.
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Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Works, New York.
Waterbury Wire Die Co., Waterbury, Ct.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Addor Wire Die Works, N. Y.
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Bellet Diamond Die Works, N. Y.
Cochaud Wire Die Corp., New York.
F. Krause & Co., Inc., Jersey City, N. J.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Wks., N. Y.

DIES—Recutting and Repolishing Machine
Wm. Haddow, Ossining, N. Y.
F. Krause. Inc., Jersey City, N. J.
Vianney Wire Die Works, New York, N. Y.

DIES—Rod and Tube Drawing
Carboloy Co., Inc., Newark, N. J.
Master Wire Die Corp., N. Y.
Union Wire Die Corp., N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
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Carboloy Co., Inc., Newark, N. J.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

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Torrington Mfg. Co., Torrington, Conn.
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Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

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FURNACES—Lead Melting
John Robertson Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
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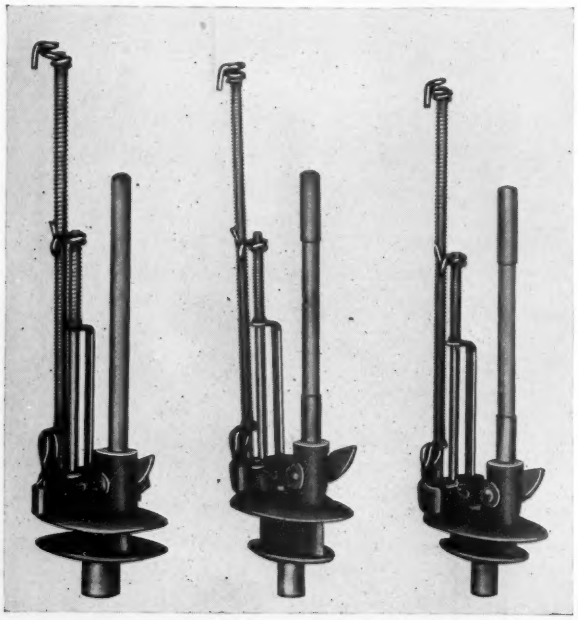

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New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

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Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
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Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
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MACHINERY—Stranding
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Watson Machine Co., Paterson, N. J.

Manufacturers of ornamental and architectural iron work are requested to send their catalogs to R. H. McLeod, Secy., Dyne & Co. Ltd., New Farm, Brisbane, Queensland, Australia.

(*Continued from page 337*)

committee from the Chamber of Commerce in Bombay or Calcutta in case of signing a contract with new customers. In making this arrangement of course the Indian buyer has first to give his time allowance, because otherwise the arbiters will not feel themselves responsible to make any decision.

Receiver In Equity Sale Wire and Strip Factory

Now operating—Fully equipped for drawing wire and shapes ¼" diameter and finer. Complete 22" and 16" wire drawing benches. Also large number of fine wire machines equipped with blocks; spooling attachment, dies, etc. Modern pot and strand annealing furnaces—enameling, tubing and rolling departments, capable of rolling strip in various sizes up to 8" in width.

Plant located within twelve miles of New York City, with railroad siding — wonderful locality with plenty of help available.

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The Next Article in The Discussion
Electro Galvanizing vs. Hot Galvanizing
Will Appear in the October Issue of Wire and Wire Products

BUYERS' GUIDE, Continued

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Fred'k M. Conran, Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrell Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Company, Paterson, N. J.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube
Fred'k M. Conran, Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrell Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Welding Wire
Micro Products Co., Peoria, Ill.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Fred'k M. Conran, Newark, N. J.
Morgan Construction Co., Worcester Mass.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Watson Machine Company, Paterson, N. J.

PACKING—Metallic Fibre
Hudson Wire Co., Ossining, N. Y.

POINTERS—Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REELS AND SPOOLS—All Kinds
R. B. Hayward Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

REEL AND TENSION STAND—
Sleeper & Hartley Inc., Worcester, Mass.

REEL CRUTCHES
R. B. Hayward Co., Chicago, Ill.
Watson Machine Co., Paterson, N. J.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.
J. T. Robertson Co., Syracuse, N. Y.

SOLDER—Silver
Handy & Harman, N. Y.

SPOOLS—Annealing—Detachable Head Handling—Wire Stitching
Mossberg Pressed Steel Corp., Attleboro, Mass.

SPOOLS—Fibre
Sefton Nat'l Fibre Can Co., St. Louis, Mo.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WIRE—Various Kinds
Hudson Wire Co., Ossining, N. Y.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

WATERBURY-FARREL

TANDEMS

No. 2 5-die machine, block type with stripper and optional floor spooler. Wire finished in coils or spooled, as preferred. Starting size 3/8 in. copper rod, finishing at No. 5 or No. 6 B. & S. gauge. Flexible - coupled enclosed herringbone drive. Antifriction bearings throughout. Aluminum swing cover for dies.

THE CULMINATION OF MORE THAN 25 YEARS AS BUILDERS OF CONTINUOUS WIRE DRAWING MACHINES OF MERIT

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A machine that meets the present day demand for high speed and maximum production efficiency. The No. 2 machine is built in both 5 and 6-die constructions. The No. 1 tandem machine is built in from 5 to 10-die construction. May we send you our complete catalogue of wire drawing machinery?

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

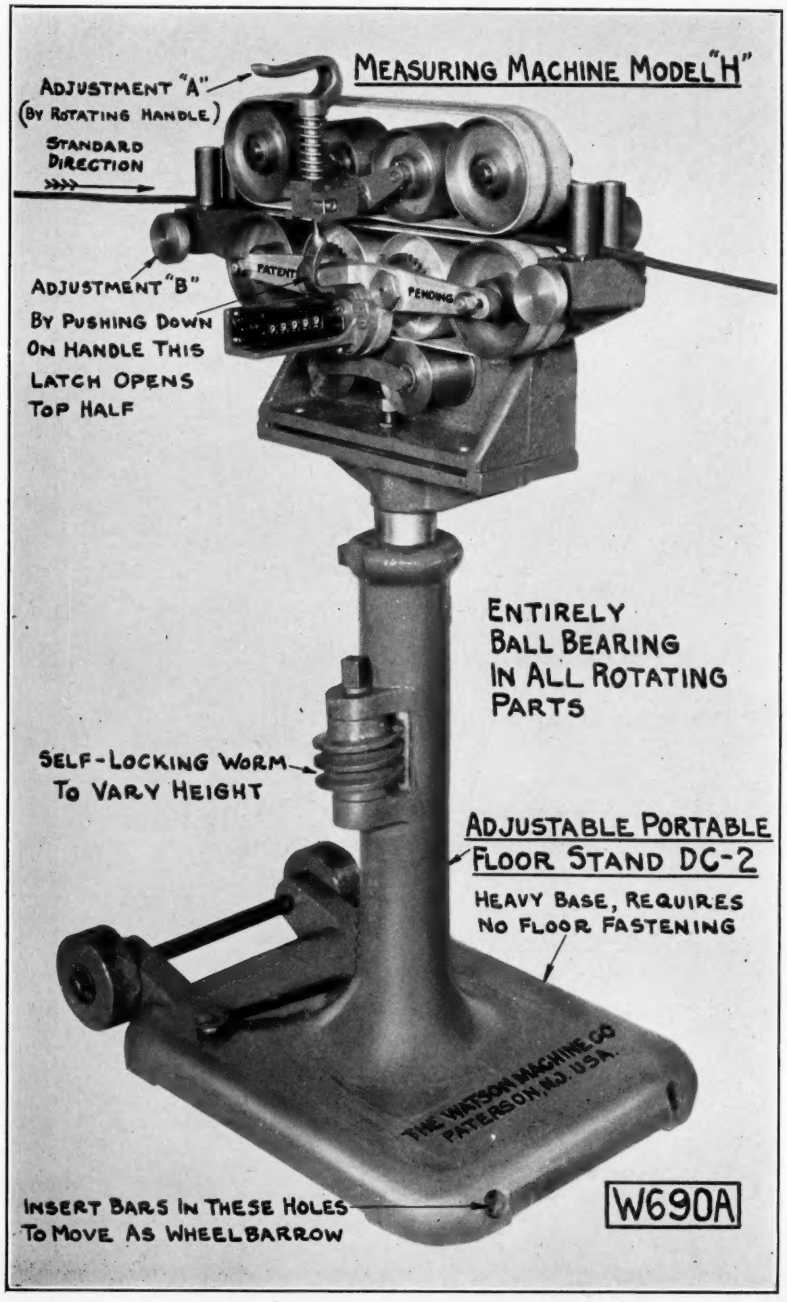
PATERSON, NEW JERSEY, U. S. A.

MEASURING MACHINE MODEL "H" (*Patent Pending*)

(For Diameters and Thicknesses up to 0.75 inch)

AN ENTIRELY NEW DESIGN, ELIMINATING SLIP OF PRODUCT RELATIVE TO MEASURING DEVICE.

(Extensive tests have proven it the most accurate machine ever developed by us).


MEASURING MACHINE MODEL "H"
ADJUSTMENT "A"
(BY ROTATING HANDLE)
STANDARD DIRECTION
ADJUSTMENT "B"
BY PUSHING DOWN ON HANDLE THIS LATCH OPENS TOP HALF
PATENTED
PENDING
ENTIRELY BALL BEARING IN ALL ROTATING PARTS
SELF-LOCKING WORM TO VARY HEIGHT
ADJUSTABLE PORTABLE FLOOR STAND DC-2
HEAVY BASE, REQUIRES NO FLOOR FASTENING
THE WATSON MACHINE CO PATERSON, N.J. U.S.A.
INSERT BARS IN THESE HOLES TO MOVE AS WHEELBARROW
W690A

On "BX" covered wire, twisted pair, and wire rope, the degree of accuracy is not affected by the uneven surface.

By removing vertical end guide rollers, flat and sheet materials can be measured.

Counters

Standard Mounting is with Direct Reading 6-place Counter in the position (*front*) of cut W690A, transferable to read vertically or horizontally.

Remote Counter with Flexible shaft can also be provided, being attached at back; at extra cost. (*This can be attached in addition to regular counter*).

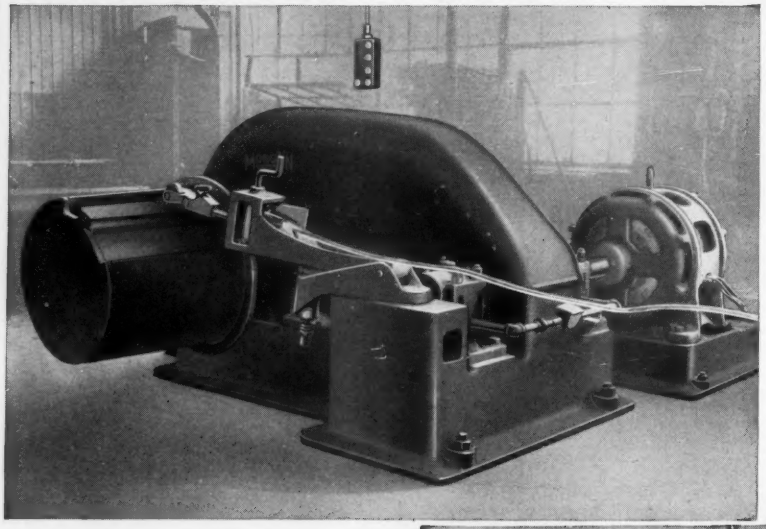
Counter with Electric Stop Contacts can be attached at back at extra cost.

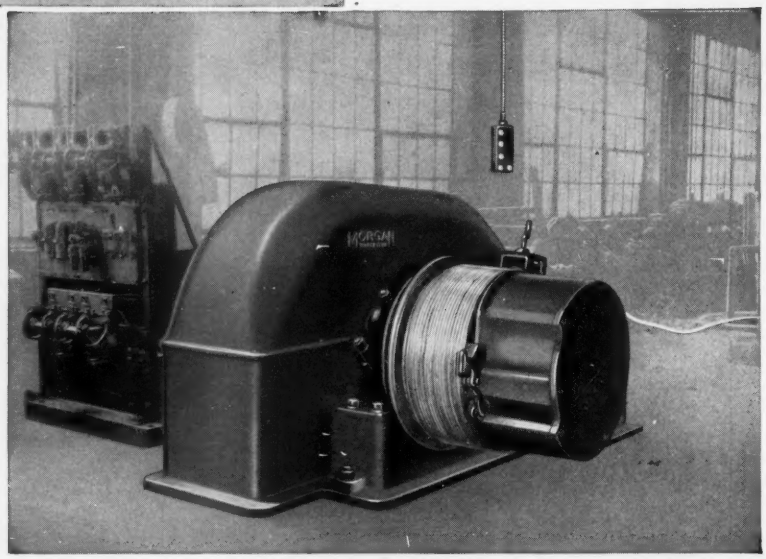
Floor Stands

The Stand Foot is designed to mount on the top of our Adjustable Portable Floor Stand DC-2.

Fixed height floor stand can also be supplied at extra cost.

MORGAN BULL BLOCK





Handles cold drawn product from ½-inch to 1-inch round and equivalent sections in other shapes. The motor, transmission and drawing block are one unit. Machine is started, stopped, reversed and controlled in all its movements by push-button through a small pendent panel over the die box.

MORGAN CONSTRUCTION CO., Worcester, Mass.

MALMEDIE & COMPANY

Sole licensee for Morgan-Connor Wire Machines in Europe

Maschinenfabrik Aktiengesellschaft **Dusseldorf, Germany**

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Engineers and Manufacturers